

Chemistry 1 (#2003340)

Version for Academic Year: 2015 - 2016

Course Number: 2003340

Abbreviated Title: CHEM 1

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to

support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.2:](#)

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.3:](#)

Explain that scientific laws are descriptions of specific

relationships under given conditions in nature, but do not offer explanations for those relationships.

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.P.8.1:](#)

Differentiate among the four states of matter.

Remarks/Examples:

Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)

[SC.912.P.8.2:](#)

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Remarks/Examples:

Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory

techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).

Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

[SC.912.P.8.3:](#)

Remarks/Examples:

Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

[SC.912.P.8.4:](#)

Remarks/Examples:

Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

[SC.912.P.8.5:](#)

Remarks/Examples:

Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.

[SC.912.P.8.6:](#)

Distinguish between bonding forces holding compounds

together and other attractive forces, including hydrogen bonding and van der Waals forces.

Remarks/Examples:

Describe how atoms combine to form molecules through ionic, covalent, and hydrogen bonding. Compare and contrast the characteristics of the interactions between atoms in ionic and covalent compounds and how these bonds form. Use electronegativity to explain the difference between polar and nonpolar covalent bonds.

Interpret formula representations of molecules and compounds in terms of composition and structure.

[SC.912.P.8.7:](#)

Remarks/Examples:

Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

[SC.912.P.8.11:](#)

Remarks/Examples:

Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.

Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

[SC.912.P.8.8:](#)

Remarks/Examples:

Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.

Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.

[SC.912.P.8.9:](#)

Remarks/Examples:

Recognize one mole equals 6.02×10^{23} particles (atoms or molecules). Determine number of particles for elements and compounds using the mole concept, in terms of number of particles, mass, and the volume of an ideal gas at specified conditions of temperature and pressure. Use

| | |
|---------------------------------|--|
| | <p>experimental data to determine percent yield, empirical formulas, molecular formulas, and calculate the mass-to-mass stoichiometry for a chemical reaction.</p> |
| SC.912.P.10.7: | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).</p> |
| SC.912.P.10.9: | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = hv$).</p> |
| SC.912.P.10.12: | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples: Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| SC.912.P.10.5: | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples: Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| SC.912.P.10.1: | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples: Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed,</p> |

| | |
|--|---|
| | <p>only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.12.10:</p> | <p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| <p>SC.912.P.12.11:</p> | <p>Describe phase transitions in terms of kinetic molecular theory.</p> |

| | |
|---|--|
| | <p>Remarks/Examples:</p> <p>Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.P.12.13:</p> | <p>Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.</p> <p>Remarks/Examples:</p> <p>Identify and explain the factors that affect the rate of dissolving (e.g., temperature, concentration, surface area, pressure, mixing). Explain that equilibrium is established when forward and reverse-reaction rates are equal.</p> |
| <p>SC.912.L.18.12:</p> | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.F-IF.2.4:</p> | <p>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given</p> |

| | |
|---|---|
| | <p>a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| <p>MAFS.912.S-ID.1.1:</p> | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context</p> |

of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.4:](#)

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

[MAFS.912.S-ID.2.5:](#)

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

[MAFS.912.S-ID.2.6:](#)

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[LAFS.1112.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

| | |
|------------------------------------|--|
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | <p>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> |
| LAFS.1112.SL.1.3: | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</p> |
| LAFS.1112.SL.2.4: | <p>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> |
| LAFS.1112.SL.2.5: | <p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> |
| LAFS.1112.RST.1.1: | <p>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> |
| LAFS.1112.RST.1.2: | <p>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> |

| | |
|-------------------------------------|--|
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax |

to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

[LAFS.1112.WHST.1.2:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.1112.WHST.2.4:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose

[LAFS.1112.WHST.2.5:](#)

| | |
|--------------------------------------|---|
| | and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Chemistry 1 Honors (#2003350)

Version for Academic Year: 2015 - 2016

Course Number: 2003350

Abbreviated Title: CHEM 1 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Chemistry I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices:

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

- MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2: Reason abstractly and quantitatively.
- MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
- MAFS.K12.MP.4: Model with mathematics.
- MAFS.K12.MP.5: Use appropriate tools strategically.
- MAFS.K12.MP.6: Attend to precision.
- MAFS.K12.MP.7: Look for and make use of structure.
- MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |

| | |
|--------------------------------------|---|
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> </div> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> </div> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> </div> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific</p> |

| | |
|--------------------------------------|---|
| | <p>method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.2:</p> | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> |

Remarks/Examples:

Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

[SC.912.P.8.4:](#)

Remarks/Examples:

Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

[SC.912.P.8.5:](#)

Remarks/Examples:

Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.

Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.

[SC.912.P.8.6:](#)

Remarks/Examples:

Describe how atoms combine to form molecules through ionic, covalent, and hydrogen bonding. Compare and contrast the characteristics of the interactions between atoms in ionic and covalent compounds and how these bonds form. Use electronegativity to explain the difference between

| | |
|---------------------------------------|---|
| | <p>polar and nonpolar covalent bonds.</p> |
| <p>SC.912.P.8.7:</p> | <p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p> |
| <p>SC.912.P.8.10:</p> | <p>Describe oxidation-reduction reactions in living and non-living systems.</p> <p>Remarks/Examples: Identify the substance(s) losing and gaining electrons in oxidation-reduction reactions. Discuss voltaic cells, various types of batteries, electrolysis of water, smelting and purification of metals, electrolysis of brine versus molten NaCl, neutralization reactions, electrolytic cells, and living systems (photosynthesis and cellular respiration).</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.P.8.8:</p> | <p>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</p> <p>Remarks/Examples: Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> |
| <p>SC.912.P.8.9:</p> | <p>Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.</p> <p>Remarks/Examples: Recognize one mole equals 6.02×10^{23} particles (atoms or molecules). Determine number of particles for elements and</p> |

| | |
|---------------------------------|--|
| | <p>compounds using the mole concept, in terms of number of particles, mass, and the volume of an ideal gas at specified conditions of temperature and pressure. Use experimental data to determine percent yield, empirical formulas, molecular formulas, and calculate the mass-to-mass stoichiometry for a chemical reaction.</p> |
| SC.912.P.8.12: | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| SC.912.P.8.13: | <p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p>Remarks/Examples: Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).</p> |
| SC.912.P.10.7: | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).</p> |
| SC.912.P.10.9: | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = h\nu$).</p> |
| SC.912.P.10.12: | <p>Differentiate between chemical and nuclear reactions.</p> |

| | |
|---------------------------------------|--|
| | <p>Remarks/Examples:</p> <p>Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples:</p> <p>Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.8:</p> | <p>Explain entropy's role in determining the efficiency of processes that convert energy to work.</p> <p>Remarks/Examples:</p> <p>Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> |

| | |
|--|--|
| | <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.12.10:</p> | <p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| <p>SC.912.P.12.11:</p> | <p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.P.12.13:</p> | <p>Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.</p> <p>Remarks/Examples:</p> <p>Identify and explain the factors that affect the rate of dissolving (e.g., temperature, concentration, surface area, pressure, mixing). Explain that equilibrium is established</p> |

| | |
|------------------------------------|--|
| | when forward and reverse-reaction rates are equal. |
| SC.912.L.17.15: | Discuss the effects of technology on environmental quality. |
| SC.912.L.17.19: | Describe how different natural resources are produced and how their rates of use and renewal limit availability. |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| | <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase |

shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).



[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.4:](#)

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

[MAFS.912.S-ID.2.5:](#)

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the

data. ★

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

[MAFS.912.S-ID.2.6:](#)

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

[LAFS.910.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the

| | |
|-----------------------------------|---|
| | evidence and reasoning presented. |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |

[LAFS.910.RST.3.9:](#)

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

[LAFS.910.RST.4.10:](#)

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.910.WHST.1.1:](#)

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.910.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to

| | |
|-------------------------------------|--|
| | <p>manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Chemistry 2 Honors (#2003360)

Version for Academic Year: 2015 - 2016

Course Number: 2003360

Abbreviated Title: CHEM 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).

- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, |

and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to

the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for</p> |

science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of

| | |
|-------------------------------|---|
| | others. |
| SC.912.N.3.3: | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| SC.912.N.3.4: | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| SC.912.N.3.5: | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.912.N.4.1: | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| SC.912.N.4.2: | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> |

| | |
|---------------------------------------|--|
| | <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.8.10:</p> | <p>Describe oxidation-reduction reactions in living and non-living systems.</p> <p>Remarks/Examples: Identify the substance(s) losing and gaining electrons in oxidation-reduction reactions. Discuss voltaic cells, various types of batteries, electrolysis of water, smelting and purification of metals, electrolysis of brine versus molten NaCl, neutralization reactions, electrolytic cells, and living systems (photosynthesis and cellular respiration).</p> |
| <p>SC.912.P.8.12:</p> | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| <p>SC.912.P.8.13:</p> | <p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p>Remarks/Examples: Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> |

| | |
|---------------------------------|---|
| | <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| SC.912.P.10.8: | <p>Explain entropy's role in determining the efficiency of processes that convert energy to work.</p> <p>Remarks/Examples:</p> <p>Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.</p> |
| SC.912.L.17.17: | <p>Assess the effectiveness of innovative methods of protecting the environment.</p> |
| SC.912.L.17.19: | <p>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</p> <p>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</p> |
| SC.912.L.17.20: | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.</p> |
| SC.912.L.18.1: | <p>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.</p> |
| SC.912.L.18.2: | <p>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</p> |
| SC.912.L.18.3: | <p>Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.</p> |
| SC.912.L.18.4: | <p>Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and</p> |

| | |
|------------------------------------|---|
| | function of enzymes. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| | <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and |

using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.4:](#)

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

[MAFS.912.S-ID.2.5:](#)

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the

data. ★

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

[MAFS.912.S-ID.2.6:](#)

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is

| | |
|------------------------------------|---|
| | required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a |

| | |
|-------------------------------------|--|
| | problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| LAFS.1112.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, |

| | |
|-------------------------------------|---|
| | <p>tables), and multimedia when useful to aiding comprehension.</p> <ul style="list-style-type: none"> b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |

[LAFS.1112.WHST.4.10:](#)

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

[ELD.K12.ELL.1.1:](#)

English language learners communicate for social and instructional purposes within the school setting.

[ELD.K12.ELL.XX.1:](#)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Earth/Space Science (#2001310)

Version for Academic Year: 2015 - 2016

Course Number: 2001310

Abbreviated Title: EARTH/SPA SCI

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

VERSION DESCRIPTION

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

GENERAL NOTES

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends

| | |
|--------------------------------------|---|
| | <p>in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|---|
| | <p>Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.3:</p> | <p>Describe and predict how the initial mass of a star determines its evolution.</p> <p>Remarks/Examples: Compare and contrast the evolution of stars of different masses (include the three outcomes of stellar evolution based on mass: black hole, neutron star, white dwarf). Differentiate between the different types of stars found on the Hertzsprung-Russell diagram and the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star.</p> |
| <p>SC.912.E.5.9:</p> | <p>Analyze the broad effects of space exploration on the economy and culture of Florida.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize the economic, technical and social benefits of spinoff technology developed through the space program.</p> |
| <p>SC.912.E.5.1:</p> | <p>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</p> <p>Remarks/Examples: Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples: Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.E.5.4:</p> | <p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p>Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.5.5:</p> | <p>Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.</p> <p>Remarks/Examples: Describe how evidence from the study of our Solar System</p> |

and newly discovered extra solar planetary systems supports the Nebular theory of the formation of planetary systems.

Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.

[SC.912.E.5.6:](#)

Remarks/Examples:

Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.

Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.

[SC.912.E.5.11:](#)

Remarks/Examples:

Determine which units of measurement are appropriate to describe distance (e.g. astronomical units, parallax, and light years).

Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and MAFS.K12.MP.6: Attend to precision.

Describe and differentiate the layers of Earth and the interactions among them.

[SC.912.E.6.1:](#)

Remarks/Examples:

Recognize the importance of the study of seismic wave data and how it can be used to determine the internal structure, density variations, and dynamic processes between Earth's layers.

Connect surface features to surface processes that are responsible for their formation.

[SC.912.E.6.2:](#)

Remarks/Examples:

Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.

[SC.912.E.6.3:](#)

Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Discuss the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. Compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). Explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).</p> |
| <p>SC.912.E.6.4:</p> | <p>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</p> <p>Remarks/Examples: Describe the effect of ocean and Gulf water currents, gravel mining, beach erosion, dune development, aquifers and ground water, salt water intrusion, springs, and sink holes on the formation of the Florida peninsula. Explain the effects of latitude, elevation, topography (land surface type), proximity to large bodies of water, and temperature of ocean currents, on climate in Florida.</p> |
| <p>SC.912.E.6.5:</p> | <p>Describe the geologic development of the present day oceans and identify commonly found features.</p> <p>Remarks/Examples: Describe the topography of the ocean floor and how it formed (e.g. plate tectonics, sea level changes).</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.E.7.2:</p> | <p>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|---|
| | <p>Explain how surface and deep-water circulation patterns (Coriolis effect, La Niña, El Niño, Southern Oscillation, upwelling, ocean surface cooling, freshwater influx, density differences, Labrador Current and Gulf Stream) impact energy transfer in the environment.</p> |
| <p>SC.912.E.7.3:</p> | <p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p>Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes.</p> |
| <p>SC.912.E.7.4:</p> | <p>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</p> <p>Remarks/Examples: Describe how latitude, altitude, topography, prevailing winds, proximity to large bodies of water, vegetation and ocean currents determine the climate of a geographic area.</p> |
| <p>SC.912.E.7.5:</p> | <p>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</p> <p>Remarks/Examples: Use models, weather maps and other tools to predict weather conditions and differentiate between accuracy of short-range and long-range weather forecasts.</p> |
| <p>SC.912.E.7.6:</p> | <p>Relate the formation of severe weather to the various physical factors.</p> <p>Remarks/Examples: Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods, thunderstorms, and drought).</p> |
| <p>SC.912.E.7.7:</p> | <p>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</p> |

| | |
|--|---|
| | <p>Remarks/Examples: Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.</p> |
| <p>SC.912.E.7.8:</p> | <p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p>Remarks/Examples: Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples: Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples: Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic</p> |

| | |
|--|---|
| | <p>fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> </div> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> </div> |
| <p>SC.912.P.10.19:</p> | <p>Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.</p> |
| <p>SC.912.P.10.20:</p> | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> </div> |
| <p>SC.912.P.12.2:</p> | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> </div> |

| | |
|--|--|
| | <p>Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples: Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.L.15.1:</p> | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| <p>SC.912.L.15.8:</p> | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>LAFS.910.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</p> |

| | |
|-----------------------------------|---|
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| LAFS.910.SL.1.2: | <p>Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.</p> |
| LAFS.910.SL.1.3: | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.</p> |
| LAFS.910.SL.2.4: | <p>Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</p> |
| LAFS.910.SL.2.5: | <p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> |
| LAFS.910.RST.1.1: | <p>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> |
| LAFS.910.RST.1.2: | <p>Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</p> |
| LAFS.910.RST.1.3: | <p>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</p> |

| | |
|------------------------------------|---|
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |

| | |
|---|--|
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.910.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.</p> |
| <p>LAFS.910.WHST.3.7:</p> | <p>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> |
| <p>LAFS.910.WHST.3.8:</p> | <p>Gather relevant information from multiple authoritative print and</p> |

digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

[LAFS.910.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

[LAFS.910.WHST.4.10:](#)

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

[ELD.K12.ELL.1.1:](#)

English language learners communicate for social and instructional purposes within the school setting.

[ELD.K12.ELL.XX.1:](#)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Earth/Space Science Honors (#2001320)

Version for Academic Year: 2015 - 2016

Course Number: 2001320

Abbreviated Title: EARTH/SPA SCI HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Earth/Space Science course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

| | |
|--------------------------------------|--|
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of</p> |

others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific

theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and

benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.E.5.3:](#)

Describe and predict how the initial mass of a star determines its evolution.

Remarks/Examples:

Compare and contrast the evolution of stars of different masses (include the three outcomes of stellar evolution based on mass: black hole, neutron star, white dwarf). Differentiate between the different types of stars found on the Hertzsprung-Russell diagram and the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star.

[SC.912.E.5.9:](#)

Analyze the broad effects of space exploration on the economy and culture of Florida.

Remarks/Examples:

Recognize the economic, technical and social benefits of spinoff technology developed through the space program.

[SC.912.E.5.10:](#)

Describe and apply the coordinate system used to locate objects in the sky.

Remarks/Examples:

Discuss how scientists determine the location of constellations, celestial spheres, and sky maps. Compare and contrast the celestial coordinate system (equatorial system) to the use of latitude and longitude to specify locations on Earth. Recognize the use of right ascension and declination in the location of objects in space, including stars and constellations.

[SC.912.E.5.1:](#)

Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin

of the universe.

Remarks/Examples:

Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).

Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.

[SC.912.E.5.2:](#)

Remarks/Examples:

Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.

Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.

Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

[SC.912.E.5.4:](#)

Remarks/Examples:

Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.

Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.

[SC.912.E.5.5:](#)

Remarks/Examples:

Describe how evidence from the study of our Solar System and newly discovered extra solar planetary systems supports the Nebular theory of the formation of planetary systems.

[SC.912.E.5.6:](#)

Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples: Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.5.11:</p> | <p>Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.</p> <p>Remarks/Examples: Determine which units of measurement are appropriate to describe distance (e.g. astronomical units, parallax, and light years).</p> <p>Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and MAFS.K12.MP.6: Attend to precision.</p> |
| <p>SC.912.E.6.1:</p> | <p>Describe and differentiate the layers of Earth and the interactions among them.</p> <p>Remarks/Examples: Recognize the importance of the study of seismic wave data and how it can be used to determine the internal structure, density variations, and dynamic processes between Earth's layers.</p> |

| | |
|--------------------------------------|--|
| <p>SC.912.E.6.2:</p> | <p>Connect surface features to surface processes that are responsible for their formation.</p> <p>Remarks/Examples: Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.</p> |
| <p>SC.912.E.6.3:</p> | <p>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</p> <p>Remarks/Examples: Discuss the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. Compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). Explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).</p> |
| <p>SC.912.E.6.4:</p> | <p>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</p> <p>Remarks/Examples: Describe the effect of ocean and Gulf water currents, gravel mining, beach erosion, dune development, aquifers and ground water, salt water intrusion, springs, and sink holes on the formation of the Florida peninsula. Explain the effects of latitude, elevation, topography (land surface type), proximity to large bodies of water, and temperature of ocean currents, on climate in Florida.</p> |
| <p>SC.912.E.6.5:</p> | <p>Describe the geologic development of the present day oceans and identify commonly found features.</p> <p>Remarks/Examples: Describe the topography of the ocean floor and how it formed (e.g. plate tectonics, sea level changes).</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.E.7.2:</p> | <p>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</p> <p>Remarks/Examples: Explain how surface and deep-water circulation patterns (Coriolis effect, La Niña, El Niño, Southern Oscillation, upwelling, ocean surface cooling, freshwater influx, density differences, Labrador Current and Gulf Stream) impact energy transfer in the environment.</p> |
| <p>SC.912.E.7.3:</p> | <p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p>Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes.</p> |
| <p>SC.912.E.7.4:</p> | <p>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</p> <p>Remarks/Examples: Describe how latitude, altitude, topography, prevailing winds, proximity to large bodies of water, vegetation and ocean currents determine the climate of a geographic area.</p> |
| <p>SC.912.E.7.5:</p> | <p>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</p> <p>Remarks/Examples: Use models, weather maps and other tools to predict weather conditions and differentiate between accuracy of short-range and long-range weather forecasts.</p> |

| | |
|--|--|
| <p>SC.912.E.7.6:</p> | <p>Relate the formation of severe weather to the various physical factors.</p> <p>Remarks/Examples: Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods, thunderstorms, and drought).</p> |
| <p>SC.912.E.7.7:</p> | <p>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</p> <p>Remarks/Examples: Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.</p> |
| <p>SC.912.E.7.8:</p> | <p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p>Remarks/Examples: Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).</p> |
| <p>SC.912.E.7.9:</p> | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</p> <p>Remarks/Examples: Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO₃⁻ and CaCO₃ as precipitate or biogenic carbonate deposits, which have an impact on climate change.</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.10.19:</p> | <p>Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody</p> |

| | |
|---------------------------------|---|
| | radiators and those that are not. |
| SC.912.P.10.20: | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> </div> |
| SC.912.P.12.2: | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> </div> |
| SC.912.P.12.4: | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> </div> |
| SC.912.L.15.1: | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> </div> |

| | |
|---|---|
| | <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| <p>SC.912.L.15.8:</p> | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.F-IF.2.4:</p> | <p>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| <p>MAFS.912.G-MG.1.2:</p> | <p>Apply concepts of density based on area and volume in modeling</p> |

| | |
|------------------------------------|--|
| | <p>situations (e.g., persons per square mile, BTUs per cubic foot). ★</p> |
| MAFS.912.S-ID.1.1: | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| MAFS.912.S-ID.1.2: | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| MAFS.912.S-ID.1.3: | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| MAFS.912.S-ID.1.4: | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| MAFS.912.S-ID.2.5: | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| MAFS.912.S-ID.2.6: | <p>Represent data on two quantitative variables on a scatter plot,</p> |

and describe how the variables are related. ★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

[LAFS.910.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

| | |
|-----------------------------------|---|
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |

[LAFS.910.RST.4.10:](#)

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.910.WHST.1.1:](#)

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.910.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone

| | |
|-------------------------------------|---|
| | <p>while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Ecology (#2000380)

Version for Academic Year: 2015 - 2016

Course Number: 2000380

Abbreviated Title: ECOLOGY

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into

words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same

outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent

examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples: Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs</p> |

| | |
|--|---|
| | <p>Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples: Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.L.15.12:</p> | <p>List the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. Use the Hardy-Weinberg equation to predict genotypes in a population from observed phenotypes.</p> |
| <p>SC.912.L.15.13:</p> | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> |
| <p>SC.912.L.15.14:</p> | <p>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</p> |
| <p>SC.912.L.15.15:</p> | <p>Describe how mutation and genetic recombination increase genetic variation.</p> |
| <p>SC.912.L.17.17:</p> | <p>Assess the effectiveness of innovative methods of protecting the environment.</p> |
| <p>SC.912.L.17.1:</p> | <p>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look</p> |

| | |
|---------------------------------|---|
| | for and make use of structure. |
| SC.912.L.17.2: | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| SC.912.L.17.3: | Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.5: | Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.2 SC.912.L.17.4 SC.912.L.17.8 SC.912.N.1.4 . |
| SC.912.L.17.6: | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| SC.912.L.17.7: | Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1 . |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.16: | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and |

groundwater pollution.

Remarks/Examples:

Integrate [HE.912.C.1.3](#). Evaluate how environment and personal health are interrelated and, [HE.912.C.1.5](#). Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

[SC.912.L.17.19:](#)

Describe how different natural resources are produced and how their rates of use and renewal limit availability.

[MAFS.912.N-Q.1.1:](#)

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

[MAFS.912.N-Q.1.3:](#)

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

[MAFS.912.F-IF.3.7:](#)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

[LAFS.910.SL.1.3:](#)

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

[LAFS.910.SL.2.4:](#)

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of

| | |
|-----------------------------------|---|
| | reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a |

| | |
|-------------------------------------|---|
| | range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |

| | |
|------------------------------------|--|
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the |

significance of the topic).

[LAFS.910.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

Write arguments focused on *discipline-specific content*.

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.1112.WHST.1.1:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the

| | |
|--------------------------------------|---|
| | <p>major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</p> <p>d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and |

| | |
|--|---|
| <u>LAFS.910.SL.1.1a:</u> | <p>concepts necessary for academic success in the content area of Science.</p> <p>Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</p> |
| <u>LAFS.910.SL.1.1b:</u> | <p>Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.</p> |
| <u>LAFS.910.SL.1.1c:</u> | <p>Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.</p> |
| <u>LAFS.910.SL.1.1d:</u> | <p>Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.</p> |

Environmental Science (#2001340)

Version for Academic Year: 2015 - 2016

Course Number: 2001340

Abbreviated Title: ENV SCI

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that

allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, |

4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in

repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust</p> |

and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

| | |
|--------------------------------------|--|
| | <p>Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| <p>SC.912.E.7.7:</p> | <p>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</p> <p>Remarks/Examples: Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.</p> |
| <p>SC.912.E.7.8:</p> | <p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p>Remarks/Examples: Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).</p> |
| <p>SC.912.E.7.9:</p> | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon,</p> |

and water.

Remarks/Examples:

Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

[SC.912.P.10.1:](#)

Remarks/Examples:

Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

[SC.912.P.10.2:](#)

Remarks/Examples:

Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).

[SC.912.L.14.6:](#)

Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.

[SC.912.L.15.3:](#)

Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.

[SC.912.L.15.13:](#)

Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive

success.

Remarks/Examples:

Annually assessed on Biology EOC. Also assesses [SC.912.L.15.14](#), [SC.912.L.15.15](#), and [SC.912.N.1.3](#).

[SC.912.L.16.10:](#)

Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.

Remarks/Examples:

Annually assessed on Biology EOC.

[SC.912.L.17.14:](#)

Assess the need for adequate waste management strategies.

[SC.912.L.17.15:](#)

Discuss the effects of technology on environmental quality.

Discuss the political, social, and environmental consequences of sustainable use of land.

[SC.912.L.17.12:](#)

Remarks/Examples:

Integrate [HE.912.C.1.3](#). Evaluate how environment and personal health are interrelated.

[SC.912.L.17.18:](#)

Describe how human population size and resource use relate to environmental quality.

Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.

[SC.912.L.17.1:](#)

Remarks/Examples:

Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.

[SC.912.L.17.4:](#)

Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

[SC.912.L.17.5:](#)

Remarks/Examples:

Annually assessed on Biology EOC. Also assesses [SC.912.L.17.2](#) [SC.912.L.17.4](#) [SC.912.L.17.8](#) [SC.912.N.1.4](#).

[SC.912.L.17.6:](#)

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

| | |
|---------------------------------|--|
| SC.912.L.17.7: | Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. |
| | <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> </div> |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| SC.912.L.17.16: | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. |
| | <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> </div> |
| SC.912.L.17.19: | Describe how different natural resources are produced and how their rates of use and renewal limit availability. |
| SC.912.L.17.20: | Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability. |
| | <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.</p> </div> |
| HE.912.C.1.3: | Evaluate how environment and personal health are interrelated. |
| | <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> </div> |

| | |
|---|---|
| | <p>Some examples may include food options within a community, prenatal care services, availability of recreational facilities.</p> |
| <p>HE.912.C.1.7:</p> | <p>Assess the degree of susceptibility to injury, illness or death if engaging in unhealthy/risky behaviors.</p> <p>Remarks/Examples: Some examples may include death from alcohol poisoning, cancer and chronic lung disease related to tobacco use, overdose from illegal drug use, date rape as a result of alcohol use and/or adulterated food or beverage, child abuse or neglect, and serial monogamy.</p> |
| <p>MAFS.912.F-IF.2.4:</p> | <p>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.S-ID.1.1:</p> | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> |

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.2.5:](#)

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

[LAFS.1112.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links

| | |
|-------------------------------------|---|
| | among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical |

texts in the grades 11–12 text complexity band independently and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.1112.WHST.1.1:](#)

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and

| | |
|--------------------------------------|---|
| | <p>techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Forensic Sciences 1 (#2002480)

Version for Academic Year: 2015 - 2016

Course Number: 2002480

Abbreviated Title: FOR SCI 1

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Elective

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into

words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being

studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

| | |
|--------------------------------------|---|
| | <p>Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and</p> |

| | |
|--------------------------------------|--|
| | <p>benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.2:</p> | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| <p>SC.912.P.8.7:</p> | <p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples:</p> |

| | |
|--|---|
| | <p>Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.P.8.12:</p> | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples: Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> |

| | |
|--|--|
| | <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.10.20:</p> | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> |
| <p>SC.912.P.12.1:</p> | <p>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</p> <p>Remarks/Examples:</p> <p>Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).</p> <p>MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.2:</p> | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference)</p> |

as functions of time.

Remarks/Examples:

Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.

Florida Standards Connections: MAFS.912.N-VM.3 (+)
Solve problems involving velocity and other quantities that can be represented by vectors.

[SC.912.P.12.3:](#)

Interpret and apply Newton's three laws of motion.

Remarks/Examples:

Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = -F_2 \text{ on } 1$ (Newton's third law).

[SC.912.P.12.5:](#)

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Remarks/Examples:

(e.g. elastic and completely inelastic collisions).

[SC.912.P.12.7:](#)

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Remarks/Examples:

Recognize that regardless of the speed of an observer or source, *in a vacuum* the speed of light is always c .

[SC.912.P.12.9:](#)

Recognize that time, length, and energy depend on the frame of reference.

Remarks/Examples:

The energy E and the momentum p depend on the frame of

| | |
|---------------------------------|--|
| | reference in which they are measured (e.g. Lorentz contraction). |
| SC.912.P.12.12: | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| SC.912.L.14.12: | Describe the anatomy and histology of bone tissue. |
| SC.912.L.14.4: | Compare and contrast structure and function of various types of microscopes. |
| SC.912.L.14.1: | <p>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</p> <p>Remarks/Examples:</p> <p>Describe how continuous investigations and/or new scientific information influenced the development of the cell theory. Recognize the contributions of scientists in the development of the cell theory.</p> |
| SC.912.L.14.2: | Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport). |
| SC.912.L.14.6: | Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. |
| SC.912.L.14.11: | Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue. |
| SC.912.L.14.34: | Describe the composition and physiology of blood, including that of the plasma and the formed elements. |
| SC.912.L.14.35: | Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions. |
| SC.912.L.14.51: | Describe the function of the vertebrate integumentary system. |

| | |
|------------------------------------|--|
| SC.912.L.15.15: | Describe how mutation and genetic recombination increase genetic variation. |
| SC.912.L.16.2: | Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles. |
| SC.912.L.16.9: | Explain how and why the genetic code is universal and is common to almost all organisms. |
| SC.912.L.16.10: | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. Remarks/Examples: Annually assessed on Biology EOC. |
| SC.912.L.16.11: | Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis. |
| SC.912.L.16.12: | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| SC.912.L.17.1: | Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.912.L.18.1: | Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11 . |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for |

more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order

| | |
|------------------------------------|---|
| | to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |

| | |
|-------------------------------------|---|
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. |

| | |
|--|--|
| | <ul style="list-style-type: none"> d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.910.WHST.3.9:</p> | <p>Draw evidence from informational texts to support analysis, reflection, and research.</p> |
| <p>LAFS.1112.WHST.1.1:</p> | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ul style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that |

which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

[LAFS.1112.WHST.2.4:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.1112.WHST.2.5:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

[LAFS.1112.WHST.2.6:](#)

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

[LAFS.1112.WHST.3.7:](#)

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

[LAFS.1112.WHST.3.8:](#)

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

| | |
|--------------------------------------|--|
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Forensic Sciences 2 (#2002490)

Version for Academic Year: 2015 - 2016

Course Number: 2002490

Abbreviated Title: FOR SCI 2

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Elective

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into

words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same

outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an

empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.E.5.8:](#)

Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.

Remarks/Examples:

Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.

[SC.912.P.8.7:](#)

Interpret formula representations of molecules and compounds in terms of composition and structure.

Remarks/Examples:

Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons

| | |
|---------------------------------|---|
| | and the charges on the ions. |
| SC.912.P.8.10: | <p>Describe oxidation-reduction reactions in living and non-living systems.</p> <p>Remarks/Examples: Identify the substance(s) losing and gaining electrons in oxidation-reduction reactions. Discuss voltaic cells, various types of batteries, electrolysis of water, smelting and purification of metals, electrolysis of brine versus molten NaCl, neutralization reactions, electrolytic cells, and living systems (photosynthesis and cellular respiration).</p> |
| SC.912.P.8.8: | <p>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</p> <p>Remarks/Examples: Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> |
| SC.912.P.8.13: | <p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p>Remarks/Examples: Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).</p> |
| SC.912.P.10.7: | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).</p> |
| SC.912.P.10.14: | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors</p> |

| | |
|---------------------------------|---|
| | and insulators. |
| SC.912.P.10.15: | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples:</p> <p>Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| SC.912.P.10.4: | Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. |
| SC.912.P.10.13: | <p>Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.</p> <p>Remarks/Examples:</p> <p>Using Coulomb's law, determine the force on a stationary charge due to other stationary charges, and explain that this force is many times greater than the gravitational force. Recognize the relationship between forces and their associated potential energies and that the electric field is directly related to the rate of change of the electric potential from point to point in space.</p> |
| SC.912.P.10.18: | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| SC.912.P.12.6: | <p>Qualitatively apply the concept of angular momentum.</p> <p>Remarks/Examples:</p> <p>Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).</p> |
| SC.912.P.12.1: | Distinguish between scalar and vector quantities and assess |

which should be used to describe an event.

Remarks/Examples:

Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).

MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

[SC.912.P.12.2:](#)

Remarks/Examples:

Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.

Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Interpret and apply Newton's three laws of motion.

[SC.912.P.12.3:](#)

Remarks/Examples:

Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = -F_2 \text{ on } 1$ (Newton's third law).

[SC.912.P.12.5:](#)

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Remarks/Examples:

| | |
|---------------------------------|---|
| | (e.g. elastic and completely inelastic collisions). |
| | Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. |
| SC.912.P.12.12: | <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| SC.912.L.14.12: | Describe the anatomy and histology of bone tissue. |
| SC.912.L.14.13: | Distinguish between bones of the axial skeleton and the appendicular skeleton. |
| SC.912.L.14.4: | Compare and contrast structure and function of various types of microscopes. |
| SC.912.L.14.6: | Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. |
| SC.912.L.14.11: | Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue. |
| SC.912.L.14.14: | Identify the major bones of the axial and appendicular skeleton. |
| SC.912.L.14.15: | Identify major markings (such as foramina, fossae, tubercles, etc.) on a skeleton. Explain why these markings are important. |
| SC.912.L.14.16: | Describe the anatomy and histology, including ultrastructure, of muscle tissue. |
| SC.912.L.14.36: | Describe the factors affecting blood flow through the cardiovascular system. |
| SC.912.L.14.43: | Describe the histology of the respiratory system. |
| SC.912.L.14.44: | Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation. |
| SC.912.L.14.46: | Describe the physiology of the digestive system, including mechanical digestion, chemical digestion, absorption and the neural and hormonal mechanisms of control. |
| SC.912.L.14.47: | Describe the physiology of urine formation by the kidney. |
| SC.912.L.16.9: | Explain how and why the genetic code is universal and is |

| | |
|---------------------------------|---|
| | common to almost all organisms. |
| SC.912.L.16.3: | Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information. Remarks/Examples: Integrate HE.912.C.1.7 . Analyze how heredity and family history can impact personal health. Annually assessed on Biology EOC. Also assesses SC.912.L.16.4 SC.912.L.16.5 SC.912.L.16.9 . |
| SC.912.L.16.4: | Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. |
| SC.912.L.16.5: | Explain the basic processes of transcription and translation, and how they result in the expression of genes. |
| SC.912.L.16.10: | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. Remarks/Examples: Annually assessed on Biology EOC. |
| SC.912.L.16.11: | Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis. |
| SC.912.L.16.12: | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| SC.912.L.17.6: | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1 . |
| SC.912.L.18.3: | Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids |

| | |
|------------------------------------|---|
| | undergo. Relate the structure and function of cell membranes. |
| SC.912.L.18.4: | Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes. |
| SC.912.L.18.10: | Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| | <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ <ul style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric |

| | |
|-----------------------------------|---|
| | functions, showing period, midline, and amplitude, and using phase shift. |
| LAFS.1112.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to |

| | |
|-------------------------------------|---|
| | enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |

| | |
|-------------------------------------|--|
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.1.1: | Write arguments focused on <i>discipline-specific content</i> . |

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the

| | |
|--------------------------------------|---|
| | <p>discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Genetics Honors (#2000440)

Version for Academic Year: 2015 - 2016

Course Number: 2000440

Abbreviated Title: GENETICS HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.

- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples:</p> </div> |

Florida Standards Connections for 6-12 Literacy in
Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory

texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

[SC.912.N.2.1:](#)

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

| | |
|--|--|
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples: Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.L.15.8:</p> | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples:</p> |

| | |
|---------------------------------|---|
| | Annually assessed on Biology EOC. Also assesses SC.912.N.1.3 , SC.912.N.1.4 , and SC.912.N.2.1 . |
| SC.912.L.15.9: | Explain the role of reproductive isolation in the process of speciation. |
| SC.912.L.15.12: | List the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. Use the Hardy-Weinberg equation to predict genotypes in a population from observed phenotypes. |
| SC.912.L.15.13: | Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.15.14 , SC.912.L.15.15 , and SC.912.N.1.3 . |
| SC.912.L.15.14: | Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow. |
| SC.912.L.15.15: | Describe how mutation and genetic recombination increase genetic variation. |
| SC.912.L.16.1: | Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.2 . |
| SC.912.L.16.2: | Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles. |
| SC.912.L.16.9: | Explain how and why the genetic code is universal and is common to almost all organisms. |
| SC.912.L.16.3: | Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information. Remarks/Examples: Integrate HE.912.C.1.7 . Analyze how heredity and family history can impact personal health. Annually assessed on Biology EOC. Also assesses SC.912.L.16.4 SC.912.L.16.5 SC.912.L.16.9 . |

| | |
|---------------------------------|--|
| SC.912.L.16.4: | Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. |
| SC.912.L.16.5: | Explain the basic processes of transcription and translation, and how they result in the expression of genes. |
| SC.912.L.16.6: | Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level. |
| SC.912.L.16.7: | Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology. |
| SC.912.L.16.8: | Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer. Remarks/Examples: Integrate HE.912.C.1.7 . Analyze how heredity and family history can impact personal health. |
| SC.912.L.16.10: | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. Remarks/Examples: Annually assessed on Biology EOC. |
| SC.912.L.16.11: | Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis. |
| SC.912.L.16.12: | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| SC.912.L.16.14: | Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. |
| SC.912.L.16.16: | Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores. |
| SC.912.L.16.17: | Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation. Remarks/Examples: Annually assessed on Biology EOC. Also assesses |

[SC.912.L.16.8](#) [SC.912.L.16.14](#) [SC.912.L.16.16](#).

Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.

[SC.912.L.17.1:](#)

Remarks/Examples:

Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.

[SC.912.L.17.8:](#)

Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

[SC.912.L.18.1:](#)

Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

Remarks/Examples:

Annually assessed on Biology EOC. Also assesses [SC.912.L.18.11](#).

[SC.912.L.18.11:](#)

Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

[MAFS.912.N-Q.1.1:](#)

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

[MAFS.912.N-Q.1.3:](#)

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

[MAFS.912.F-IF.2.4:](#)

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★

[MAFS.912.F-IF.3.7:](#)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value

- functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
 - d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
 - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of

| | |
|------------------------------------|--|
| | extreme data points. |
| MAFS.912.S-ID.1.4: | Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★ |
| MAFS.912.S-ID.2.5: | Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★ |
| MAFS.912.S-ID.2.6: | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> Informally assess the fit of a function by plotting and analyzing residuals. Fit a linear function for a scatter plot that suggests a linear association. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> </div> |
| MAFS.912.S-IC.2.6: | Evaluate reports based on data. ★ |
| LAFS.1112.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. |

| | |
|------------------------------------|--|
| | <ul style="list-style-type: none"> b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other |

| | |
|-------------------------------------|--|
| | domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the |

- discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

| | |
|--|---|
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
|--|---|

[LAFS.1112.WHST.2.4:](#) Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.1112.WHST.2.5:](#) Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

[LAFS.1112.WHST.2.6:](#) Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

[LAFS.1112.WHST.3.7:](#) Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve

| | |
|--------------------------------------|---|
| | a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| HE.912.C.1.3: | Evaluate how environment and personal health are interrelated. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>Remarks/Examples: Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.</p> </div> |
| HE.912.C.1.7: | Analyze how heredity and family history can impact personal health. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>Remarks/Examples: Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.</p> </div> |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Integrated Science 1 (#2002400)

Version for Academic Year: 2015 - 2016

Course Number: 2002400

Abbreviated Title: INTEG SCI 1

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support

analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

- MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2: Reason abstractly and quantitatively.
- MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
- MAFS.K12.MP.4: Model with mathematics.
- MAFS.K12.MP.5: Use appropriate tools strategically.
- MAFS.K12.MP.6: Attend to precision.
- MAFS.K12.MP.7: Look for and make use of structure.
- MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of

scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

[SC.912.N.1.7:](#)

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

[SC.912.N.2.1:](#)

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

| | |
|--------------------------------------|---|
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.E.5.1:</p> | <p>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples: Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.E.5.4:</p> | <p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p>Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.1:</p> | <p>Describe and differentiate the layers of Earth and the interactions among them.</p> <p>Remarks/Examples: Recognize the importance of the study of seismic wave data and how it can be used to determine the internal structure, density variations, and dynamic processes between Earth's layers.</p> |
| <p>SC.912.E.6.2:</p> | <p>Connect surface features to surface processes that are responsible for their formation.</p> <p>Remarks/Examples: Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.</p> |
| <p>SC.912.E.6.3:</p> | <p>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</p> <p>Remarks/Examples: Discuss the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. Compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). Explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves</p> |

| | |
|--------------------------------------|--|
| | <p>among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.E.7.3:</p> | <p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p>Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.2:</p> | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples: Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and “gold foil” experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.</p> |

| | |
|---------------------------------------|---|
| | <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.4:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.5:</p> | <p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.</p> |
| <p>SC.912.P.8.7:</p> | <p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p> |
| <p>SC.912.P.10.7:</p> | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).</p> |

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

[SC.912.P.10.1:](#)

Remarks/Examples:

Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.

[SC.912.P.10.4:](#)

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

[SC.912.P.10.20:](#)

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Remarks/Examples:

Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.

[SC.912.P.12.3:](#)

Interpret and apply Newton's three laws of motion.

Remarks/Examples:

Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's

| | |
|---------------------------------------|--|
| | <p>second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = -F_2 \text{ on } 1$ (Newton's third law).</p> |
| <p>SC.912.L.14.4:</p> | <p>Compare and contrast structure and function of various types of microscopes.</p> |
| <p>SC.912.L.14.1:</p> | <p>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</p> <p>Remarks/Examples: Describe how continuous investigations and/or new scientific information influenced the development of the cell theory. Recognize the contributions of scientists in the development of the cell theory.</p> |
| <p>SC.912.L.14.2:</p> | <p>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</p> |
| <p>SC.912.L.14.3:</p> | <p>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.14.2.</p> |
| <p>SC.912.L.14.7:</p> | <p>Relate the structure of each of the major plant organs and tissues to physiological processes.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC.</p> |
| <p>SC.912.L.15.1:</p> | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| <p>SC.912.L.15.4:</p> | <p>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</p> |

| | |
|---------------------------------|---|
| SC.912.L.15.5: | <p>Explain the reasons for changes in how organisms are classified. Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> |
| SC.912.L.15.6: | <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| SC.912.L.15.8: | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| SC.912.L.16.1: | <p>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.2.</p> |
| SC.912.L.16.14: | <p>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</p> |
| SC.912.L.16.16: | <p>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</p> |
| SC.912.L.16.17: | <p>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.8 SC.912.L.16.14 SC.912.L.16.16.</p> |
| SC.912.L.17.2: | <p>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</p> |
| SC.912.L.17.3: | <p>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</p> |
| SC.912.L.17.4: | <p>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</p> |

| | |
|--|---|
| <p>SC.912.L.17.9:</p> | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> </div> |
| <p>SC.912.L.17.11:</p> | <p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</p> |
| <p>SC.912.L.18.1:</p> | <p>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.</p> </div> |
| <p>SC.912.L.18.7:</p> | <p>Identify the reactants, products, and basic functions of photosynthesis.</p> |
| <p>SC.912.L.18.8:</p> | <p>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</p> |
| <p>SC.912.L.18.9:</p> | <p>Explain the interrelated nature of photosynthesis and cellular respiration.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10.</p> </div> |
| <p>SC.912.L.18.12:</p> | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>LAFS.910.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative</p> |

discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

[LAFS.910.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

[LAFS.910.SL.2.4:](#)

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

[LAFS.910.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.910.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

[LAFS.910.RST.1.2:](#)

Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

| | |
|------------------------------------|---|
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the |

| | |
|------------------------------------|---|
| | <p>discipline in which they are writing.</p> <p>e. Provide a concluding statement or section that follows from or supports the argument presented.</p> |
| | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.</p> <p>c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.</p> <p>d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.910.WHST.1.2: | |
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve |

| | |
|--|---|
| | a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| <u>LAFS.910.WHST.3.8:</u> | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| <u>LAFS.910.WHST.3.9:</u> | Draw evidence from informational texts to support analysis, reflection, and research. |
| <u>LAFS.910.WHST.4.10:</u> | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and instructional purposes within the school setting. |
| <u>ELD.K12.ELL.XX.1:</u> | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Integrated Science 1 Honors (#2002410)

Version for Academic Year: 2015 - 2016

Course Number: 2002410

Abbreviated Title: INTEG SCI 1 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Integrated Science 1 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
MAFS.K12.MP.2: Reason abstractly and quantitatively.
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
MAFS.K12.MP.4: Model with mathematics.
MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations.</p> |

| | |
|--------------------------------------|---|
| | <p>Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and</p> |

benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.

[SC.912.E.5.1:](#)

Remarks/Examples:

Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).

Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.

[SC.912.E.5.2:](#)

Remarks/Examples:

Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.

Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.

Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

[SC.912.E.5.4:](#)

Remarks/Examples:

Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass

| | |
|--------------------------------------|--|
| | <p>ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.1:</p> | <p>Describe and differentiate the layers of Earth and the interactions among them.</p> <p>Remarks/Examples: Recognize the importance of the study of seismic wave data and how it can be used to determine the internal structure, density variations, and dynamic processes between Earth's layers.</p> |
| <p>SC.912.E.6.2:</p> | <p>Connect surface features to surface processes that are responsible for their formation.</p> <p>Remarks/Examples: Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.</p> |
| <p>SC.912.E.6.3:</p> | <p>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Discuss the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. Compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). Explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.E.7.3:</p> | <p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p>Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes.</p> |

| | |
|--------------------------------------|--|
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.2:</p> | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples: Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and “gold foil” experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.4:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model</p> |

with mathematics.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

[SC.912.P.8.5:](#)

Remarks/Examples:

Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.

Interpret formula representations of molecules and compounds in terms of composition and structure.

[SC.912.P.8.7:](#)

Remarks/Examples:

Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.

Distinguish between endothermic and exothermic chemical processes.

[SC.912.P.10.7:](#)

Remarks/Examples:

Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

[SC.912.P.10.1:](#)

Remarks/Examples:

Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs
Light to heat in laser drills
Electrical to sound in radios
Sound to electrical in microphones
Electrical to chemical in battery rechargers
Chemical to electrical in dry cells
Mechanical to electrical in generators [power plants]
Nuclear to heat in nuclear reactors
Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.

| | |
|---------------------------------|--|
| SC.912.P.10.4: | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| SC.912.P.10.8: | <p>Explain entropy's role in determining the efficiency of processes that convert energy to work.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.</p> </div> |
| SC.912.P.10.19: | <p>Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.</p> |
| SC.912.P.10.20: | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> </div> |
| SC.912.P.12.3: | <p>Interpret and apply Newton's three laws of motion.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_{1 \text{ on } 2} = -F_{2 \text{ on } 1}$</p> </div> |

| | |
|--------------------------------|--|
| | on 1 (Newton's third law). |
| SC.912.P.12.7: | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples: Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| SC.912.P.12.8: | <p>Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.</p> <p>Remarks/Examples: Recognize that the speed of light in any reference frame is the central postulate of the Special Theory of Relativity. As speeds approach zero, Special Relativity tends towards equivalence with Newton's Laws of Motion.</p> |
| SC.912.P.12.9: | <p>Recognize that time, length, and energy depend on the frame of reference.</p> <p>Remarks/Examples: The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction).</p> |
| SC.912.L.14.4: | <p>Compare and contrast structure and function of various types of microscopes.</p> |
| SC.912.L.14.1: | <p>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</p> <p>Remarks/Examples: Describe how continuous investigations and/or new scientific information influenced the development of the cell theory. Recognize the contributions of scientists in the development of the cell theory.</p> |
| SC.912.L.14.2: | <p>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</p> |
| SC.912.L.14.7: | <p>Relate the structure of each of the major plant organs and tissues to physiological processes.</p> <p>Remarks/Examples:</p> |

| | |
|---------------------------------|--|
| | Annually Assessed on Biology EOC. |
| SC.912.L.15.1: | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| SC.912.L.15.4: | Describe how and why organisms are hierarchically classified and based on evolutionary relationships. |
| SC.912.L.15.5: | Explain the reasons for changes in how organisms are classified. |
| SC.912.L.15.6: | <p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| SC.912.L.15.8: | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| SC.912.L.16.1: | <p>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.2.</p> |
| SC.912.L.16.14: | Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. |
| SC.912.L.16.16: | Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores. |
| SC.912.L.16.17: | Compare and contrast mitosis and meiosis and relate to the |

| | |
|---------------------------------|---|
| | <p>processes of sexual and asexual reproduction and their consequences for genetic variation.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.8 SC.912.L.16.14 SC.912.L.16.16.</p> </div> |
| SC.912.L.17.15: | Discuss the effects of technology on environmental quality. |
| SC.912.L.17.2: | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| SC.912.L.17.3: | Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.9: | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> </div> |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.19: | Describe how different natural resources are produced and how their rates of use and renewal limit availability. |
| SC.912.L.18.1: | <p>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.</p> </div> |
| SC.912.L.18.2: | Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things. |
| SC.912.L.18.3: | Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in |

| | |
|------------------------------------|---|
| | living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes. |
| SC.912.L.18.4: | Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes. |
| SC.912.L.18.7: | Identify the reactants, products, and basic functions of photosynthesis. |
| SC.912.L.18.8: | Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. |
| SC.912.L.18.9: | Explain the interrelated nature of photosynthesis and cellular respiration. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10.</p> </div> |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ |

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).



[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

| | |
|---|---|
| | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> Informally assess the fit of a function by plotting and analyzing residuals. Fit a linear function for a scatter plot that suggests a linear association. <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.910.RST.1.1:</p> | <p>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> |
| <p>LAFS.910.RST.1.2:</p> | <p>Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the</p> |

| | |
|------------------------------------|---|
| | text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone |

| | |
|---|---|
| | <p>while attending to the norms and conventions of the discipline in which they are writing.</p> <p>e. Provide a concluding statement or section that follows from or supports the argument presented.</p> |
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.</p> <p>c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.</p> <p>d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p> |
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.910.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.</p> |
| <p>LAFS.910.WHST.3.7:</p> | <p>Conduct short as well as more sustained research projects to</p> |

| | |
|--|---|
| | answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| <u>LAFS.910.WHST.3.8:</u> | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| <u>LAFS.910.WHST.3.9:</u> | Draw evidence from informational texts to support analysis, reflection, and research. |
| <u>LAFS.910.WHST.4.10:</u> | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and instructional purposes within the school setting. |
| <u>ELD.K12.ELL.XX.1:</u> | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Integrated Science 2 (#2002420)

Version for Academic Year: 2015 - 2016

Course Number: 2002420

Abbreviated Title: INTEG SCI 2

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support

analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

- MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2: Reason abstractly and quantitatively.
- MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
- MAFS.K12.MP.4: Model with mathematics.
- MAFS.K12.MP.5: Use appropriate tools strategically.
- MAFS.K12.MP.6: Attend to precision.
- MAFS.K12.MP.7: Look for and make use of structure.
- MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and

critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have

to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.2:](#)

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.E.5.3:](#)

Describe and predict how the initial mass of a star determines its evolution.

Remarks/Examples:

Compare and contrast the evolution of stars of different masses (include the three outcomes of stellar evolution based on mass: black hole, neutron star, white dwarf). Differentiate between the different types of stars found on the Hertzsprung-Russell diagram and the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star.

[SC.912.E.5.5:](#)

Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.

Remarks/Examples:

Describe how evidence from the study of our Solar System and newly discovered extra solar planetary systems supports the Nebular theory of the formation of planetary systems.

[SC.912.E.5.6:](#)

Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.

| | |
|---------------------------------------|--|
| | <p>Remarks/Examples: Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.</p> |
| <p>SC.912.E.7.4:</p> | <p>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</p> <p>Remarks/Examples: Describe how latitude, altitude, topography, prevailing winds, proximity to large bodies of water, vegetation and ocean currents determine the climate of a geographic area.</p> |
| <p>SC.912.E.7.7:</p> | <p>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</p> <p>Remarks/Examples: Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.</p> |
| <p>SC.912.P.8.6:</p> | <p>Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.</p> <p>Remarks/Examples: Describe how atoms combine to form molecules through ionic, covalent, and hydrogen bonding. Compare and contrast the characteristics of the interactions between atoms in ionic and covalent compounds and how these bonds form. Use electronegativity to explain the difference between polar and nonpolar covalent bonds.</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.P.8.8:</p> | <p>Characterize types of chemical reactions, for example: redox,</p> |

| | |
|--|---|
| | <p>acid-base, synthesis, and single and double replacement reactions.</p> <p>Remarks/Examples: Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> |
| <p>SC.912.P.8.9:</p> | <p>Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.</p> <p>Remarks/Examples: Recognize one mole equals 6.02×10^{23} particles (atoms or molecules). Determine number of particles for elements and compounds using the mole concept, in terms of number of particles, mass, and the volume of an ideal gas at specified conditions of temperature and pressure. Use experimental data to determine percent yield, empirical formulas, molecular formulas, and calculate the mass-to-mass stoichiometry for a chemical reaction.</p> |
| <p>SC.912.P.8.12:</p> | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| <p>SC.912.P.8.13:</p> | <p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p>Remarks/Examples: Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).</p> |
| <p>SC.912.P.10.12:</p> | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples: Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new</p> |

| | |
|---------------------------------|---|
| | atoms. Identify real-world examples where chemical and nuclear reactions occur every day. |
| SC.912.P.10.14: | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| SC.912.P.10.15: | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples: Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| SC.912.P.10.5: | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples: Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| SC.912.P.10.10: | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples: Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| SC.912.P.12.1: | <p>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</p> <p>Remarks/Examples: Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).</p> <p>MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| SC.912.P.12.2: | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> |

| | |
|--|--|
| | <p>Remarks/Examples:</p> <p>Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples:</p> <p>Describe Newton’s law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.L.14.6:</p> | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| <p>SC.912.L.14.26:</p> | <p>Identify the major parts of the brain on diagrams or models.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.L.14.36:</p> | <p>Describe the factors affecting blood flow through the cardiovascular system.</p> |
| <p>SC.912.L.14.52:</p> | <p>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.14.6 HE.912.C.1.7 and HE.912.C.1.5.</p> |
| <p>SC.912.L.15.8:</p> | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |

| | |
|---------------------------------|---|
| SC.912.L.15.15: | Describe how mutation and genetic recombination increase genetic variation. |
| | Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance. |
| SC.912.L.16.1: | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.16.2.</p> |
| SC.912.L.16.2: | Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles. |
| SC.912.L.16.9: | Explain how and why the genetic code is universal and is common to almost all organisms. |
| | Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information. |
| SC.912.L.16.3: | <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health. Annually assessed on Biology EOC. Also assesses SC.912.L.16.4 SC.912.L.16.5 SC.912.L.16.9.</p> |
| SC.912.L.16.4: | Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. |
| SC.912.L.16.5: | Explain the basic processes of transcription and translation, and how they result in the expression of genes. |
| | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. |
| SC.912.L.16.10: | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| SC.912.L.16.13: | Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy. |
| | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| SC.912.L.16.16: | Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division |

| | |
|------------------------------------|---|
| | results in the formation of haploid gametes or spores. |
| SC.912.L.16.17: | <p>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.8 SC.912.L.16.14 SC.912.L.16.16.</p> </div> |
| SC.912.L.17.9: | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> </div> |
| SC.912.L.18.1: | <p>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.</p> </div> |
| SC.912.L.18.7: | Identify the reactants, products, and basic functions of photosynthesis. |
| SC.912.L.18.8: | Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. |
| SC.912.L.18.9: | <p>Explain the interrelated nature of photosynthesis and cellular respiration.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10.</p> </div> |
| SC.912.L.18.10: | Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| LAFS.910.SL.1.1: | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse |

| | |
|-----------------------------------|--|
| | <p>partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying |

| | |
|------------------------------------|---|
| | out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. |

- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.910.WHST.1.2:](#)

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

[LAFS.910.WHST.2.4:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.910.WHST.2.5:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

[LAFS.910.WHST.2.6:](#)

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

[LAFS.910.WHST.3.7:](#)

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate;

| | |
|-------------------------------------|---|
| | synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| HE.912.C.1.3: | <p>Evaluate how environment and personal health are interrelated.</p> <p>Remarks/Examples: Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.</p> |
| HE.912.C.1.5: | <p>Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> <p>Remarks/Examples: Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.</p> |
| HE.912.C.1.7: | <p>Analyze how heredity and family history can impact personal health.</p> <p>Remarks/Examples: Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.</p> |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Integrated Science 2 Honors (#2002430)

Version for Academic Year: 2015 - 2016

Course Number: 2002430

Abbreviated Title: INTEG SCI 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Integrated Science 2 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural

| | |
|--------------------------------------|---|
| | <p>phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.E.5.3:</p> | <p>Describe and predict how the initial mass of a star determines its evolution.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Compare and contrast the evolution of stars of different masses (include the three outcomes of stellar evolution based on mass: black hole, neutron star, white dwarf). Differentiate between the different types of stars found on the Hertzsprung-Russell diagram and the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star.</p> |
| <p>SC.912.E.5.5:</p> | <p>Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.</p> <p>Remarks/Examples: Describe how evidence from the study of our Solar System and newly discovered extra solar planetary systems supports the Nebular theory of the formation of planetary systems.</p> |
| <p>SC.912.E.5.6:</p> | <p>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</p> <p>Remarks/Examples: Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.</p> |
| <p>SC.912.E.7.2:</p> | <p>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</p> <p>Remarks/Examples: Explain how surface and deep-water circulation patterns (Coriolis effect, La Niña, El Niño, Southern Oscillation, upwelling, ocean surface cooling, freshwater influx, density differences, Labrador Current and Gulf Stream) impact energy transfer in the environment.</p> |
| <p>SC.912.E.7.4:</p> | <p>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</p> <p>Remarks/Examples: Describe how latitude, altitude, topography, prevailing winds, proximity to large bodies of water, vegetation and ocean currents determine the climate of a geographic area.</p> |

Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.

[SC.912.E.7.7:](#)

Remarks/Examples:

Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.

Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.

[SC.912.P.8.6:](#)

Remarks/Examples:

Describe how atoms combine to form molecules through ionic, covalent, and hydrogen bonding. Compare and contrast the characteristics of the interactions between atoms in ionic and covalent compounds and how these bonds form. Use electronegativity to explain the difference between polar and nonpolar covalent bonds.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

[SC.912.P.8.11:](#)

Remarks/Examples:

Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.

Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

[SC.912.P.8.8:](#)

Remarks/Examples:

Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.

Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.

[SC.912.P.8.9:](#)

Remarks/Examples:

Recognize one mole equals 6.02×10^{23} particles (atoms or molecules). Determine number of particles for elements and compounds using the mole concept, in terms of number of

| | |
|---------------------------------|--|
| | <p>particles, mass, and the volume of an ideal gas at specified conditions of temperature and pressure. Use experimental data to determine percent yield, empirical formulas, molecular formulas, and calculate the mass-to-mass stoichiometry for a chemical reaction.</p> |
| SC.912.P.8.12: | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| SC.912.P.8.13: | <p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p>Remarks/Examples: Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).</p> |
| SC.912.P.10.9: | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = h\nu$).</p> |
| SC.912.P.10.12: | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples: Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| SC.912.P.10.14: | <p>Differentiate among conductors, semiconductors, and insulators.</p> |

| | |
|--|--|
| | <p>Remarks/Examples:</p> <p>Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| <p>SC.912.P.10.15:</p> | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples:</p> <p>Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples:</p> <p>Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.20:</p> | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and</p> |

waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.

[SC.912.P.10.21:](#)

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Remarks/Examples:

Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).

[SC.912.P.10.22:](#)

Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

Remarks/Examples:

Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.

[SC.912.P.12.1:](#)

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Remarks/Examples:

Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).

MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.

[SC.912.P.12.2:](#)

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Remarks/Examples:

Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time,

| | |
|--|---|
| | <p>speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples: Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.P.12.11:</p> | <p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples: Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples: Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.L.14.5:</p> | <p>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</p> |
| <p>SC.912.L.14.6:</p> | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| <p>SC.912.L.14.7:</p> | <p>Relate the structure of each of the major plant organs and tissues to physiological processes.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC.</p> |

| | |
|--|--|
| <p>SC.912.L.14.26:</p> | <p>Identify the major parts of the brain on diagrams or models.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.L.14.27:</p> | <p>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum and cerebrum.</p> |
| <p>SC.912.L.14.52:</p> | <p>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.14.6 HE.912.C.1.7 and HE.912.C.1.5.</p> |
| <p>SC.912.L.15.15:</p> | <p>Describe how mutation and genetic recombination increase genetic variation.</p> |
| <p>SC.912.L.16.1:</p> | <p>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.2.</p> |
| <p>SC.912.L.16.2:</p> | <p>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</p> |
| <p>SC.912.L.16.9:</p> | <p>Explain how and why the genetic code is universal and is common to almost all organisms.</p> |
| <p>SC.912.L.16.3:</p> | <p>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</p> <p>Remarks/Examples: Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health. Annually assessed on Biology EOC. Also assesses SC.912.L.16.4 SC.912.L.16.5 SC.912.L.16.9.</p> |
| <p>SC.912.L.16.4:</p> | <p>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</p> |

| | |
|---------------------------------|--|
| SC.912.L.16.5: | Explain the basic processes of transcription and translation, and how they result in the expression of genes. |
| SC.912.L.16.7: | Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology. |
| SC.912.L.16.10: | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. Remarks/Examples: Annually assessed on Biology EOC. |
| SC.912.L.16.12: | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| SC.912.L.16.13: | Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy. Remarks/Examples: Annually assessed on Biology EOC. |
| SC.912.L.16.14: | Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. |
| SC.912.L.16.16: | Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores. |
| SC.912.L.16.17: | Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.8 SC.912.L.16.14 SC.912.L.16.16 . |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Remarks/Examples: Annually assessed on Biology EOC. Also assesses |

| | |
|------------------------------------|---|
| | SC.912.E.7.1. |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.18.1: | Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11. |
| SC.912.L.18.7: | Identify the reactants, products, and basic functions of photosynthesis. |
| SC.912.L.18.8: | Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. |
| SC.912.L.18.9: | Explain the interrelated nature of photosynthesis and cellular respiration. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10. |
| SC.912.L.18.10: | Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features |

of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).



Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

[MAFS.912.S-ID.1.1:](#)

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

| | |
|---|--|
| | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.910.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and |

| | |
|-----------------------------------|---|
| | <p>researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</p> <p>b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.</p> <p>c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.</p> <p>d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.</p> |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other |

| | |
|------------------------------------|---|
| | domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| | Write arguments focused on <i>discipline-specific content</i> . |
| LAFS.910.WHST.1.1: | <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |

| | |
|---|--|
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.910.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.</p> |
| <p>LAFS.910.WHST.3.7:</p> | <p>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> |
| <p>LAFS.910.WHST.3.8:</p> | <p>Gather relevant information from multiple authoritative print and</p> |

| | |
|-------------------------------------|---|
| | digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| HE.912.C.1.3: | Evaluate how environment and personal health are interrelated. Remarks/Examples: Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions. |
| HE.912.C.1.5: | Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases. Remarks/Examples: Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease. |
| HE.912.C.1.7: | Analyze how heredity and family history can impact personal health. Remarks/Examples: Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Integrated Science 3 (#2002440)

Version for Academic Year: 2015 - 2016

Course Number: 2002440

Abbreviated Title: INTEG SCI 3

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to

support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.2:](#)

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes

| | |
|--------------------------------------|---|
| | <p>that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.9:</p> | <p>Analyze the broad effects of space exploration on the economy and culture of Florida.</p> <p>Remarks/Examples: Recognize the economic, technical and social benefits of spinoff technology developed through the space program.</p> |
| <p>SC.912.E.6.4:</p> | <p>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</p> <p>Remarks/Examples: Describe the effect of ocean and Gulf water currents, gravel mining, beach erosion, dune development, aquifers and ground water, salt water intrusion, springs, and sink holes on the formation of the Florida peninsula. Explain the effects of latitude, elevation, topography (land surface type), proximity to large bodies of water, and temperature of ocean currents, on climate in Florida.</p> |
| <p>SC.912.E.7.6:</p> | <p>Relate the formation of severe weather to the various physical factors.</p> <p>Remarks/Examples: Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods, thunderstorms, and drought).</p> |
| <p>SC.912.E.7.8:</p> | <p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p>Remarks/Examples: Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence</p> |

| | |
|---------------------------------------|---|
| | <p>human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).</p> |
| <p>SC.912.E.7.9:</p> | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</p> <p>Remarks/Examples: Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.</p> |
| <p>SC.912.P.8.10:</p> | <p>Describe oxidation-reduction reactions in living and non-living systems.</p> <p>Remarks/Examples: Identify the substance(s) losing and gaining electrons in oxidation-reduction reactions. Discuss voltaic cells, various types of batteries, electrolysis of water, smelting and purification of metals, electrolysis of brine versus molten NaCl, neutralization reactions, electrolytic cells, and living systems (photosynthesis and cellular respiration).</p> |
| <p>SC.912.P.10.9:</p> | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = h\nu$).</p> |
| <p>SC.912.P.10.3:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples: Use calorimetry to illustrate conservation of energy. Differentiate between the different types of</p> |

| | |
|--|---|
| | <p>systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them</p> |

to phenomena and applications.

Remarks/Examples:

Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.

[SC.912.P.10.21:](#)

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Remarks/Examples:

Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).

[SC.912.P.10.22:](#)

Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

Remarks/Examples:

Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.

[SC.912.P.12.6:](#)

Qualitatively apply the concept of angular momentum.

Remarks/Examples:

Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).

[SC.912.P.12.5:](#)

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Remarks/Examples:

(e.g. elastic and completely inelastic collisions).

[SC.912.P.12.7:](#)

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

| | |
|--|--|
| | <p>Remarks/Examples:</p> <p>Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| <p>SC.912.P.12.9:</p> | <p>Recognize that time, length, and energy depend on the frame of reference.</p> <p>Remarks/Examples:</p> <p>The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction).</p> |
| <p>SC.912.P.12.10:</p> | <p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| <p>SC.912.P.12.11:</p> | <p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.P.12.13:</p> | <p>Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.</p> |

| | |
|---------------------------------|---|
| | <p>Remarks/Examples:</p> <p>Identify and explain the factors that affect the rate of dissolving (e.g., temperature, concentration, surface area, pressure, mixing). Explain that equilibrium is established when forward and reverse-reaction rates are equal.</p> |
| SC.912.L.15.1: | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| SC.912.L.15.6: | <p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| SC.912.L.15.10: | <p>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</p> |
| SC.912.L.15.13: | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> |
| SC.912.L.15.14: | <p>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</p> |
| SC.912.L.15.15: | <p>Describe how mutation and genetic recombination increase genetic variation.</p> |
| SC.912.L.16.4: | <p>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</p> |
| SC.912.L.16.8: | <p>Explain the relationship between mutation, cell cycle, and</p> |

| | |
|---------------------------------|--|
| | <p>uncontrolled cell growth potentially resulting in cancer.</p> <p>Remarks/Examples: Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health.</p> |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.16.13: | <p>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.17.5: | <p>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.2 SC.912.L.17.4 SC.912.L.17.8 SC.912.N.1.4.</p> |
| SC.912.L.17.6: | <p>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</p> |
| SC.912.L.17.8: | <p>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</p> |
| SC.912.L.17.11: | <p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</p> |
| SC.912.L.17.13: | <p>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</p> |
| SC.912.L.17.20: | <p>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</p> <p>Remarks/Examples:</p> |

| | |
|------------------------------------|---|
| | Annually assessed on Biology EOC. Also assesses SC.912.L.17.11 , SC.912.L.17.13 , SC.912.N.1.3 . |
| SC.912.L.18.10: | Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| | Remarks/Examples: Annually assessed on Biology EOC. |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ <ul style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, |

| | |
|---|--|
| | <p>and showing end behavior.</p> <p>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.</p> |
| <p>MAFS.912.S-ID.1.1:</p> | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative</p> |

frequencies). Recognize possible associations and trends in the data. ★

[LAFS.1112.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and

| | |
|-------------------------------------|---|
| | to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| | Write arguments focused on <i>discipline-specific content</i> . |
| LAFS.1112.WHST.1.1: | <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and |

thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

[LAFS.1112.WHST.1.2:](#)

| | |
|--------------------------------------|---|
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Integrated Science 3 Honors (#2002450)

Version for Academic Year: 2015 - 2016

Course Number: 2002450

Abbreviated Title: INTEG SCI 3 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Integrated Science 3 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work.

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.

5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.

- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples:</p> </div> |

Florida Standards Connections for 6-12 Literacy in
Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory

texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

[SC.912.N.1.5:](#)

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being

studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

[SC.912.N.1.7:](#)

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|---|
| | <p>Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.E.5.9:</p> | <p>Analyze the broad effects of space exploration on the economy and culture of Florida.</p> <p>Remarks/Examples: Recognize the economic, technical and social benefits of spinoff technology developed through the space program.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.4:</p> | <p>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</p> <p>Remarks/Examples: Describe the effect of ocean and Gulf water currents, gravel mining, beach erosion, dune development, aquifers and ground water, salt water intrusion, springs, and sink holes on the formation of the Florida peninsula. Explain the effects of latitude, elevation, topography (land surface type), proximity to large bodies of water, and temperature of ocean currents, on climate in Florida.</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which</p> |

| | |
|---------------------------------------|--|
| | <p>are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.E.7.5:</p> | <p>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</p> <p>Remarks/Examples: Use models, weather maps and other tools to predict weather conditions and differentiate between accuracy of short-range and long-range weather forecasts.</p> |
| <p>SC.912.E.7.6:</p> | <p>Relate the formation of severe weather to the various physical factors.</p> <p>Remarks/Examples: Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods, thunderstorms, and drought).</p> |
| <p>SC.912.E.7.8:</p> | <p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p>Remarks/Examples: Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).</p> |
| <p>SC.912.E.7.9:</p> | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</p> <p>Remarks/Examples: Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.</p> |
| <p>SC.912.P.8.10:</p> | <p>Describe oxidation-reduction reactions in living and non-living systems.</p> <p>Remarks/Examples:</p> |

| | |
|--|---|
| | <p>Identify the substance(s) losing and gaining electrons in oxidation-reduction reactions. Discuss voltaic cells, various types of batteries, electrolysis of water, smelting and purification of metals, electrolysis of brine versus molten NaCl, neutralization reactions, electrolytic cells, and living systems (photosynthesis and cellular respiration).</p> |
| <p>SC.912.P.10.9:</p> | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples:</p> <p>Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = hv$).</p> |
| <p>SC.912.P.10.3:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.13:</p> | <p>Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.</p> <p>Remarks/Examples:</p> <p>Using Coulomb's law, determine the force on a stationary charge due to other stationary charges, and explain that this force is many times greater than the gravitational force. Recognize the relationship between forces and their associated potential energies and that the electric field is directly related to the rate of change of the electric potential from point to point in space.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| <p>SC.912.P.10.17:</p> | <p>Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and</p> |

| | |
|--|--|
| | <p>magnetic fields.</p> <p>Remarks/Examples:</p> <p>Recognize that an oscillating charge creates an oscillating electric field which gives rise to electromagnetic waves. Recognize a changing magnetic field makes an electric field, and a changing electric field makes a magnetic field, and these phenomena are expressed mathematically through the Faraday law and the Ampere-Maxwell law.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> |
| <p>SC.912.P.10.22:</p> | <p>Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.</p> <p>Remarks/Examples:</p> <p>Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.</p> |
| <p>SC.912.P.12.6:</p> | <p>Qualitatively apply the concept of angular momentum.</p> <p>Remarks/Examples:</p> <p>Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is</p> |

| | |
|---------------------------------|--|
| | <p>conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).</p> |
| SC.912.P.12.5: | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples: (e.g. elastic and completely inelastic collisions).</p> |
| SC.912.P.12.7: | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples: Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| SC.912.P.12.9: | <p>Recognize that time, length, and energy depend on the frame of reference.</p> <p>Remarks/Examples: The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction).</p> |
| SC.912.P.12.10: | <p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples: Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| SC.912.P.12.11: | <p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples: Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| SC.912.P.12.12: | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.P.12.13:</p> | <p>Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.</p> <p>Remarks/Examples:</p> <p>Identify and explain the factors that affect the rate of dissolving (e.g., temperature, concentration, surface area, pressure, mixing). Explain that equilibrium is established when forward and reverse-reaction rates are equal.</p> |
| <p>SC.912.L.15.1:</p> | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| <p>SC.912.L.15.2:</p> | <p>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</p> |
| <p>SC.912.L.15.3:</p> | <p>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</p> |
| <p>SC.912.L.15.4:</p> | <p>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</p> |
| <p>SC.912.L.15.5:</p> | <p>Explain the reasons for changes in how organisms are classified.</p> |
| <p>SC.912.L.15.6:</p> | <p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <p>Remarks/Examples:</p> |

| | |
|---------------------------------|---|
| | <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| SC.912.L.15.8: | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| SC.912.L.15.10: | <p>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</p> |
| SC.912.L.15.13: | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> |
| SC.912.L.15.14: | <p>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</p> |
| SC.912.L.15.15: | <p>Describe how mutation and genetic recombination increase genetic variation.</p> |
| SC.912.L.16.4: | <p>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</p> |
| SC.912.L.16.8: | <p>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</p> <p>Remarks/Examples: Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health.</p> |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.16.13: | <p>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human</p> |

| | |
|---------------------------------|--|
| | <p>development from fertilization to birth and major changes that occur in each trimester of pregnancy.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| SC.912.L.17.2: | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.5: | <p>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.2 SC.912.L.17.4 SC.912.L.17.8 SC.912.N.1.4.</p> </div> |
| SC.912.L.17.6: | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> </div> |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| SC.912.L.17.16: | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. |

| | |
|------------------------------------|--|
| | <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| SC.912.L.17.20: | <p>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.</p> |
| SC.912.L.18.10: | <p>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</p> |
| SC.912.L.18.11: | <p>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</p> |
| SC.912.L.18.12: | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| MAFS.912.N-Q.1.3: | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| MAFS.912.N-VM.1.3: | <p>Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| MAFS.912.F-IF.2.4: | <p>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| MAFS.912.F-IF.3.7: | <p>Graph functions expressed symbolically and show key features</p> |

of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

| | |
|---|--|
| | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. |
| | <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> |

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.1112.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

[LAFS.1112.RST.1.2:](#)

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

| | |
|-------------------------------------|--|
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax |

| | |
|--|---|
| | <p>to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <ul style="list-style-type: none"> d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.1112.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.1112.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose</p> |

| | |
|--------------------------------------|---|
| | and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Intensive Science (#2000300)

Version for Academic Year: 2015 - 2016

Course Number: 2000300

Abbreviated Title: INTENS SCI

Number of Credits: Multiple Credit (more than 1 credit)

Course Length: Multiple (M) - Course length can vary

Course Type: Elective

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007). This course should be tailored to meet the needs of the individual student according to his/her deficiencies. Appropriate benchmarks from the NGSSS for Science and applicable Florida Standards (CCSS) for Literacy and Mathematics, including the Standards for mathematical Practice, should be identified to develop an appropriate curriculum.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- [MAFS.K12.MP.1.1](#) Make sense of problems and persevere in solving them.
- [MAFS.K12.MP.2.1](#) Reason abstractly and quantitatively.
- [MAFS.K12.MP.3.1](#) Construct viable arguments and critique the reasoning of others.
- [MAFS.K12.MP.4.1](#) Model with mathematics.
- [MAFS.K12.MP.5.1](#) Use appropriate tools strategically.
- [MAFS.K12.MP.6.1](#) Attend to precision.
- [MAFS.K12.MP.7.1](#) Look for and make use of structure.
- [MAFS.K12.MP.8.1](#) Look for and express regularity in repeated reasoning.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

| Name | Description |
|-----------------------------------|--|
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Limnology (#2000390)

Version for Academic Year: 2015 - 2016

Course Number: 2000390

Abbreviated Title: LIMNOLOGY

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into

words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same

outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent

examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples: Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of</p> |

| | |
|---------------------------------|---|
| | energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry). |
| SC.912.L.14.6: | Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. |
| SC.912.L.17.14: | Assess the need for adequate waste management strategies. |
| SC.912.L.17.1: | Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.912.L.17.2: | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| SC.912.L.17.3: | Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.5: | Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.2 SC.912.L.17.4 SC.912.L.17.8 SC.912.N.1.4 . |
| SC.912.L.17.6: | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| SC.912.L.17.7: | Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. |

| | |
|------------------------------------|--|
| | <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. |
| SC.912.L.17.16: | <p>Remarks/Examples: Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| | Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability. |
| SC.912.L.17.20: | <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.</p> |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| | <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ |

| | |
|-----------------------------------|--|
| | <ul style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| LAFS.910.SL.1.2: | <p>Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.</p> |
| LAFS.910.SL.1.3: | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.</p> |
| LAFS.910.SL.2.4: | <p>Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</p> |
| LAFS.910.SL.2.5: | <p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> |
| LAFS.1112.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. |

- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.1112.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

[LAFS.1112.RST.1.2:](#)

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

[LAFS.1112.RST.1.3:](#)

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

[LAFS.1112.RST.2.4:](#)

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

| | |
|-------------------------------------|--|
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.2: | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or |

technical processes.

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

[LAFS.910.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

[LAFS.1112.WHST.1.1:](#)

Write arguments focused on *discipline-specific content*.

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between

| | |
|--|---|
| | <p>claim(s) and counterclaims.</p> <ul style="list-style-type: none"> d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.1112.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.1112.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.1112.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to</p> |

| | |
|--------------------------------------|---|
| | ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |
| LAFS.910.SL.1.1a: | Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. |
| LAFS.910.SL.1.1b: | Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. |
| LAFS.910.SL.1.1c: | Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. |
| LAFS.910.SL.1.1d: | Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |

Marine Science 1 (#2002500)

Version for Academic Year: 2015 - 2016

Course Number: 2002500

Abbreviated Title: MARINE SCI 1

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that

allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, |

4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in

repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading</p> |

to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.7.9:</p> | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</p> <p>Remarks/Examples: Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits,</p> |

| | |
|--|--|
| | <p>which have an impact on climate change.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.20:</p> | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> |
| <p>SC.912.L.14.6:</p> | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| <p>SC.912.L.15.13:</p> | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> |
| <p>SC.912.L.17.1:</p> | <p>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</p> |

| | |
|--|--|
| | <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.L.17.2:</p> | <p>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</p> |
| <p>SC.912.L.17.3:</p> | <p>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</p> |
| <p>SC.912.L.17.4:</p> | <p>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</p> |
| <p>SC.912.L.17.6:</p> | <p>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</p> |
| <p>SC.912.L.17.7:</p> | <p>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</p> |
| <p>SC.912.L.17.8:</p> | <p>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</p> |
| <p>SC.912.L.17.9:</p> | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> |
| <p>SC.912.L.17.10:</p> | <p>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</p> |
| <p>SC.912.L.17.11:</p> | <p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</p> |
| <p>SC.912.L.17.16:</p> | <p>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</p> <p>Remarks/Examples: Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment</p> |

| | |
|------------------------------------|---|
| | of communicable and chronic diseases. |
| SC.912.L.18.12: | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| MAFS.912.S-ID.1.1: | Represent data with plots on the real number line (dot plots, |

histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

[MAFS.912.S-ID.1.2:](#)

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

[MAFS.912.S-ID.1.3:](#)

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a

| | |
|------------------------------------|--|
| | <p>hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.</p> <p>d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.</p> |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, or orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the |

| | |
|-------------------------------------|--|
| | information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| LAFS.1112.WHST.1.2: | Write informative/explanatory texts, including the narration of |

historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

| | |
|-------------------------------------|--|
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess |

| | |
|---|--|
| | the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| <u>LAFS.1112.WHST.3.9:</u> | Draw evidence from informational texts to support analysis, reflection, and research. |
| <u>LAFS.1112.WHST.4.10:</u> | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and instructional purposes within the school setting. |
| <u>ELD.K12.ELL.XX.1:</u> | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Marine Science 1 Honors (#2002510)

Version for Academic Year: 2015 - 2016

Course Number: 2002510

Abbreviated Title: MARINE SCI 1 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Marine Science I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct |

- and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
 4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
 5. **Plan investigations,** (Design and evaluate a scientific investigation).
 6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
 7. **Pose answers, explanations, or descriptions of events,**
 8. **Generate explanations that explicate or describe natural phenomena (inferences),**
 9. **Use appropriate evidence and reasoning to justify these explanations to others,**
 10. **Communicate results of scientific investigations, and**
 11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form

(e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it

is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and,
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.E.7.6:](#)

Relate the formation of severe weather to the various physical factors.

Remarks/Examples:

Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods,

| | |
|---------------------------------|--|
| | thunderstorms, and drought). |
| SC.912.E.7.9: | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</p> <p>Remarks/Examples: Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.</p> |
| SC.912.P.10.2: | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples: Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| SC.912.P.10.20: | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> <p>Remarks/Examples: Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> |
| SC.912.L.14.6: | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| SC.912.L.15.13: | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive</p> |

| | |
|---------------------------------|--|
| | <p>success.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.17.17: | Assess the effectiveness of innovative methods of protecting the environment. |
| SC.912.L.17.18: | Describe how human population size and resource use relate to environmental quality. |
| SC.912.L.17.1: | <p>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| SC.912.L.17.2: | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| SC.912.L.17.3: | Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.6: | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| SC.912.L.17.7: | Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. |

| | |
|------------------------------------|--|
| | <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.16: | <p>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</p> <p>Remarks/Examples: Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| SC.912.L.18.12: | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for |

more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

| | |
|---|---|
| | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> |

| | |
|------------------------------------|--|
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | <p>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> |
| LAFS.1112.SL.1.3: | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</p> |
| LAFS.1112.SL.2.4: | <p>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> |
| LAFS.1112.SL.2.5: | <p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> |
| LAFS.1112.RST.1.1: | <p>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> |
| LAFS.1112.RST.1.2: | <p>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> |

[LAFS.1112.RST.1.3:](#)

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

[LAFS.1112.RST.2.4:](#)

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

[LAFS.1112.RST.2.5:](#)

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

[LAFS.1112.WHST.1.1:](#)

Write arguments focused on *discipline-specific content*.

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding

- comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

| | |
|--------------------------------------|---|
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection |

| | |
|--|---|
| | and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and instructional purposes within the school setting. |
| <u>ELD.K12.ELL.XX.1:</u> | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Marine Science 2 (#2002520)

Version for Academic Year: 2015 - 2016

Course Number: 2002520

Abbreviated Title: MARINE SCI 2

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that

allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, |

4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in

repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading</p> |

to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.7.4:</p> | <p>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</p> <p>Remarks/Examples: Describe how latitude, altitude, topography, prevailing winds, proximity to large bodies of water, vegetation and ocean currents determine the climate of a geographic area.</p> |

[SC.912.E.7.8:](#)

Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.

Remarks/Examples:

Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).

[SC.912.E.7.9:](#)

Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.

Remarks/Examples:

Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.

[SC.912.P.10.2:](#)

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Remarks/Examples:

Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).

[SC.912.P.10.20:](#)

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Remarks/Examples:

Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave

| | |
|------------------------------------|--|
| | whose speed depends on the properties of the medium in which it propagates. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.5: | Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.2 SC.912.L.17.4 SC.912.L.17.8 SC.912.N.1.4 . |
| SC.912.L.17.7: | Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| SC.912.L.17.16: | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. Remarks/Examples: Integrate HE.912.C.1.3 . Evaluate how environment and personal health are interrelated and, HE.912.C.1.5 . Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases. |
| SC.912.L.18.2: | Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things. |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two |

| | |
|---|---|
| | <p>quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| <p>MAFS.912.G-MG.1.2:</p> | <p>Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★</p> |
| <p>MAFS.912.S-ID.1.1:</p> | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a</p> </div> |

| | |
|---|--|
| | <p>data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students</p> </div> |

| | |
|---|---|
| | <p>assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| <p>LAFS.1112.SL.1.2:</p> | <p>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> |
| <p>LAFS.1112.SL.1.3:</p> | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</p> |
| <p>LAFS.1112.SL.2.4:</p> | <p>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> |
| <p>LAFS.1112.SL.2.5:</p> | <p>Make strategic use of digital media (e.g., textual, graphical,</p> |

| | |
|-------------------------------------|---|
| | audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| | Write arguments focused on <i>discipline-specific content</i> . |
| LAFS.1112.WHST.1.1: | <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), |

- counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the

| | |
|--------------------------------------|---|
| | significance of the topic). |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Marine Science 2 Honors (#2002530)

Version for Academic Year: 2015 - 2016

Course Number: 2002530

Abbreviated Title: MARINE SCI 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Marine Science 2 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct |

- and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
 4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
 5. **Plan investigations,** (Design and evaluate a scientific investigation).
 6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
 7. **Pose answers, explanations, or descriptions of events,**
 8. **Generate explanations that explicate or describe natural phenomena (inferences),**
 9. **Use appropriate evidence and reasoning to justify these explanations to others,**
 10. **Communicate results of scientific investigations, and**
 11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form

(e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it

is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and,
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.E.7.2:](#)

Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.

Remarks/Examples:

Explain how surface and deep-water circulation patterns (Coriolis effect, La Niña, El Niño, Southern Oscillation,

| | |
|--------------------------------------|---|
| | <p>upwelling, ocean surface cooling, freshwater influx, density differences, Labrador Current and Gulf Stream) impact energy transfer in the environment.</p> |
| <p>SC.912.E.7.3:</p> | <p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p>Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes.</p> |
| <p>SC.912.E.7.4:</p> | <p>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</p> <p>Remarks/Examples: Describe how latitude, altitude, topography, prevailing winds, proximity to large bodies of water, vegetation and ocean currents determine the climate of a geographic area.</p> |
| <p>SC.912.E.7.5:</p> | <p>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</p> <p>Remarks/Examples: Use models, weather maps and other tools to predict weather conditions and differentiate between accuracy of short-range and long-range weather forecasts.</p> |
| <p>SC.912.E.7.8:</p> | <p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p>Remarks/Examples: Describe and discuss the conditions that bring about floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, and tsunamis and how these conditions can influence human behavior (e.g. energy alternatives, conservation, migration, storm preparedness).</p> |
| <p>SC.912.E.7.9:</p> | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon,</p> |

and water.

Remarks/Examples:

Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

[SC.912.P.10.2:](#)

Remarks/Examples:

Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

[SC.912.P.10.20:](#)

Remarks/Examples:

Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.

[SC.912.L.17.15:](#)

Discuss the effects of technology on environmental quality.

[SC.912.L.17.4:](#)

Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

[SC.912.L.17.5:](#)

Remarks/Examples:

Annually assessed on Biology EOC. Also assesses [SC.912.L.17.2](#) [SC.912.L.17.4](#) [SC.912.L.17.8](#)

| | |
|------------------------------------|--|
| | SC.912.N.1.4. |
| SC.912.L.17.7: | Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.10: | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| SC.912.L.17.16: | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. Remarks/Examples: Integrate HE.912.C.1.3 . Evaluate how environment and personal health are interrelated and, HE.912.C.1.5 . Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases. |
| SC.912.L.18.12: | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. Remarks/Examples: Annually assessed on Biology EOC. |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features |

of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

| | |
|---|---|
| | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> |

| | |
|------------------------------------|--|
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | <p>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> |
| LAFS.1112.SL.1.3: | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</p> |
| LAFS.1112.SL.2.4: | <p>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> |
| LAFS.1112.SL.2.5: | <p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> |
| LAFS.1112.RST.1.1: | <p>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> |
| LAFS.1112.RST.1.2: | <p>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> |

| | |
|-------------------------------------|--|
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax |

to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

[LAFS.1112.WHST.1.2:](#)

[LAFS.1112.WHST.2.4:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.1112.WHST.2.5:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose

| | |
|--------------------------------------|---|
| | and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Nuclear Radiation (#2003400)

Version for Academic Year: 2015 - 2016

Course Number: 2003400

Abbreviated Title: NUCLEAR RADI

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes: Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or

produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). |

5. **Plan investigations**, (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)**, (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events**,
8. **Generate explanations that explicate or describe natural phenomena (inferences)**,
9. **Use appropriate evidence and reasoning to justify these explanations to others**,
10. **Communicate results of scientific investigations**, and
11. **Evaluate the merits of the explanations produced by others**.

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.1.3:</p> | <p>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</p> <p>Remarks/Examples: Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.</p> <p>Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others</p> |
| <p>SC.912.N.1.4:</p> | <p>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</p> <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.2:](#)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g.

| | |
|--------------------------------------|--|
| | <p>controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and</p> |

| | |
|--------------------------------------|---|
| | <p>quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |

Describe the function of models in science, and identify the wide range of models used in science.

[SC.912.N.3.5:](#)

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

[SC.912.N.4.1:](#)

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

[SC.912.N.4.2:](#)

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Describe and predict how the initial mass of a star determines its evolution.

[SC.912.E.5.3:](#)

Remarks/Examples:

Compare and contrast the evolution of stars of different masses (include the three outcomes of stellar evolution based on mass: black hole, neutron star, white dwarf).

| | |
|--------------------------------------|---|
| | <p>Differentiate between the different types of stars found on the Hertzsprung-Russell diagram and the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star.</p> |
| <p>SC.912.E.5.1:</p> | <p>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</p> <p>Remarks/Examples: Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples: Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.E.5.4:</p> | <p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p>Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g.</p> |

| | |
|--------------------------------------|--|
| | <p>telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples:</p> |

| | |
|---------------------------------------|---|
| | <p>Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.4:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.5:</p> | <p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.</p> |
| <p>SC.912.P.10.9:</p> | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = hv$).</p> |

| | |
|--|---|
| <p>SC.912.P.10.12:</p> | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples:</p> <p>Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic</p> |

| | |
|---------------------------------|--|
| | fields, as well as changing magnetic fields and electric fields, and their application to modern technologies. |
| | <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| SC.912.P.10.18: | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| SC.912.P.12.5: | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples: (e.g. elastic and completely inelastic collisions).</p> |
| SC.912.L.14.6: | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| SC.912.L.15.2: | <p>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</p> |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.17.14: | <p>Assess the need for adequate waste management strategies.</p> |
| SC.912.L.17.15: | <p>Discuss the effects of technology on environmental quality.</p> |
| SC.912.L.17.17: | <p>Assess the effectiveness of innovative methods of protecting the environment.</p> |
| SC.912.L.17.13: | <p>Discuss the need for adequate monitoring of environmental</p> |

| | |
|---|--|
| <p>SC.912.L.17.16:</p> | <p>parameters when making policy decisions.</p> <p>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> </div> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.F-IF.2.4:</p> | <p>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

[MAFS.912.S-ID.1.1:](#)

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

[MAFS.912.S-ID.1.2:](#)

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

[MAFS.912.S-ID.1.3:](#)

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

[MAFS.912.S-ID.2.6:](#)

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

[LAFS.1112.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing

| | |
|-------------------------------------|---|
| | perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | Write arguments focused on <i>discipline-specific content</i> . |

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the

| | |
|--------------------------------------|---|
| | <p>discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Nuclear Radiation Honors (#2020710)

Version for Academic Year: 2015 - 2016

Course Number: 2020710

Abbreviated Title: NUC RADI HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Nuclear Radiation course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.

- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in</p> </div> |

Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific

procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct

viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

[SC.912.N.1.5:](#)

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

[SC.912.N.1.7:](#)

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make

sense of problems and persevere in solving them and
MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.2:](#)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.3:](#)

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|--|
| | <p>Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> |

| | |
|--------------------------------------|---|
| | <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.3:</p> | <p>Describe and predict how the initial mass of a star determines its evolution.</p> <p>Remarks/Examples: Compare and contrast the evolution of stars of different masses (include the three outcomes of stellar evolution based on mass: black hole, neutron star, white dwarf). Differentiate between the different types of stars found on the Hertzsprung-Russell diagram and the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star.</p> |
| <p>SC.912.E.5.1:</p> | <p>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</p> <p>Remarks/Examples: Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|---|
| | <p>Identify patterns that influence the formation, hierarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.E.5.4:</p> | <p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p>Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> |

Remarks/Examples:

Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.

Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.

[SC.912.E.7.1:](#)

Remarks/Examples:

Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.

Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

[SC.912.P.8.3:](#)

Remarks/Examples:

Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

[SC.912.P.8.4:](#)

Remarks/Examples:

Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons

| | |
|--|--|
| | <p>and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.5:</p> | <p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.</p> |
| <p>SC.912.P.10.9:</p> | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = hv$).</p> |
| <p>SC.912.P.10.12:</p> | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples: Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples: Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of</p> |

energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).

Explain entropy's role in determining the efficiency of processes that convert energy to work.

[SC.912.P.10.8:](#)

Remarks/Examples:

Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

[SC.912.P.10.10:](#)

Remarks/Examples:

Recognize and discuss the effect of each force on the structure of matter and the evidence for it.

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

[SC.912.P.10.11:](#)

Remarks/Examples:

Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

[SC.912.P.10.16:](#)

Remarks/Examples:

Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces.

| | |
|---------------------------------|--|
| | <p>Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| SC.912.P.10.18: | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| SC.912.P.12.5: | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples:</p> <p>(e.g. elastic and completely inelastic collisions).</p> |
| SC.912.P.12.7: | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples:</p> <p>Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| SC.912.P.12.9: | <p>Recognize that time, length, and energy depend on the frame of reference.</p> <p>Remarks/Examples:</p> <p>The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction).</p> |
| SC.912.L.14.6: | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| SC.912.L.15.2: | <p>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</p> |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> |

| | |
|------------------------------------|---|
| | <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.17.14: | Assess the need for adequate waste management strategies. |
| SC.912.L.17.15: | Discuss the effects of technology on environmental quality. |
| SC.912.L.17.17: | Assess the effectiveness of innovative methods of protecting the environment. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. |
| SC.912.L.17.16: | <p>Remarks/Examples: Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ |
| MAFS.912.F-IF.3.7: | <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when |

- suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
 - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#) Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

[MAFS.912.S-ID.1.1:](#)

Remarks/Examples:
 In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#) Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:
 In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

[MAFS.912.S-ID.1.3:](#)

Remarks/Examples:
 In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.4:](#) Use the mean and standard deviation of a data set to fit it to a

| | |
|---|--|
| | <p>normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> Informally assess the fit of a function by plotting and analyzing residuals. Fit a linear function for a scatter plot that suggests a linear association. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> </div> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. Propel conversations by posing and responding to |

| | |
|------------------------------------|--|
| | <p>questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.</p> <p>d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.</p> |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into |

| | |
|-------------------------------------|--|
| | categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| | Write arguments focused on <i>discipline-specific content</i> . |
| LAFS.1112.WHST.1.1: | <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |

| | |
|--|---|
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.1112.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.1112.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.1112.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.</p> |
| <p>LAFS.1112.WHST.3.7:</p> | <p>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> |
| <p>LAFS.1112.WHST.3.8:</p> | <p>Gather relevant information from multiple authoritative print</p> |

and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

[LAFS.1112.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

[LAFS.1112.WHST.4.10:](#)

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

[ELD.K12.ELL.1.1:](#)

English language learners communicate for social and instructional purposes within the school setting.

[ELD.K12.ELL.XX.1:](#)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Physical Science (#2003310)

Version for Academic Year: 2015 - 2016

Course Number: 2003310

Abbreviated Title: PHY SCI

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support

analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
MAFS.K12.MP.2: Reason abstractly and quantitatively.
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
MAFS.K12.MP.4: Model with mathematics.
MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of

| | |
|--------------------------------------|---|
| | <p>scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples:</p> |

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.3:](#)

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.E.7.1:](#)

Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.

Remarks/Examples:

Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.

[SC.912.P.8.1:](#)

Differentiate among the four states of matter.

Remarks/Examples:

Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)

[SC.912.P.8.2:](#)

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Remarks/Examples:

Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).

[SC.912.P.8.4:](#)

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.5:</p> | <p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.</p> |
| <p>SC.912.P.8.7:</p> | <p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.P.8.8:</p> | <p>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</p> <p>Remarks/Examples: Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> |

| | |
|--|---|
| <p>SC.912.P.10.7:</p> | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).</p> |
| <p>SC.912.P.10.12:</p> | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples: Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| <p>SC.912.P.10.14:</p> | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| <p>SC.912.P.10.15:</p> | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples: Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples: Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.3:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples: Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only</p> |

| | |
|--|---|
| | <p>transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> </div> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> </div> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> </div> |
| <p>SC.912.P.12.2:</p> | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> |

Remarks/Examples:

Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.

Florida Standards Connections: MAFS.912.N-VM.3 (+)
Solve problems involving velocity and other quantities that can be represented by vectors.

Interpret and apply Newton's three laws of motion.

[SC.912.P.12.3:](#)

Remarks/Examples:

Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = -F_2 \text{ on } 1$ (Newton's third law).

Describe how the gravitational force between two objects depends on their masses and the distance between them.

[SC.912.P.12.4:](#)

Remarks/Examples:

Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

[SC.912.P.12.7:](#)

Remarks/Examples:

Recognize that regardless of the speed of an observer or source, *in a vacuum* the speed of light is always c .

[SC.912.P.12.10:](#)

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

| | |
|--|--|
| | <p>Remarks/Examples:</p> <p>Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| <p>SC.912.P.12.11:</p> | <p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.L.18.7:</p> | <p>Identify the reactants, products, and basic functions of photosynthesis.</p> |
| <p>SC.912.L.18.8:</p> | <p>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</p> |
| <p>SC.912.L.18.12:</p> | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on</p> |

| | |
|-----------------------------------|---|
| | measurement when reporting quantities. ★ |
| LAFS.910.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the |

| | |
|------------------------------------|--|
| | text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and |

| | |
|---|--|
| | <p>evidence, and between claim(s) and counterclaims.</p> <ul style="list-style-type: none"> d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.910.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display</p> |

| | |
|-------------------------------------|---|
| | information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Physical Science Honors (#2003320)

Version for Academic Year: 2015 - 2016

Course Number: 2003320

Abbreviated Title: PHY SCI HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Physical Science course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make</p> |

sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.3:](#)

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

| | |
|--------------------------------------|--|
| | <p>Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.2:</p> | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples:</p> |

Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

[SC.912.P.8.4:](#)

Remarks/Examples:

Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

[SC.912.P.8.5:](#)

Remarks/Examples:

Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.

Interpret formula representations of molecules and compounds in terms of composition and structure.

[SC.912.P.8.7:](#)

Remarks/Examples:

Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.

[SC.912.P.8.11:](#)

Relate acidity and basicity to hydronium and hydroxyl ion

concentration and pH.

Remarks/Examples:

Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.

Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

[SC.912.P.8.8:](#)

Remarks/Examples:

Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.

Distinguish between endothermic and exothermic chemical processes.

[SC.912.P.10.7:](#)

Remarks/Examples:

Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).

Differentiate between chemical and nuclear reactions.

[SC.912.P.10.12:](#)

Remarks/Examples:

Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.

Differentiate among conductors, semiconductors, and insulators.

[SC.912.P.10.14:](#)

Remarks/Examples:

Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

[SC.912.P.10.15:](#)

Remarks/Examples:

Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.

| | |
|---|---|
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples:</p> <p>Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.3:</p> <p>SC.912.P.10.1:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> |

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> |
| <p>SC.912.P.12.6:</p> | <p>Qualitatively apply the concept of angular momentum.</p> <p>Remarks/Examples:</p> <p>Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).</p> |
| <p>SC.912.P.12.1:</p> | <p>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</p> <p>Remarks/Examples:</p> <p>Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).</p> <p>MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.2:</p> | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> <p>Remarks/Examples:</p> <p>Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.3:</p> | <p>Interpret and apply Newton's three laws of motion.</p> <p>Remarks/Examples:</p> <p>Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to</p> |

| | |
|--|---|
| | <p>move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = -F_2 \text{ on } 1$ (Newton's third law).</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples:</p> <p>Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.P.12.5:</p> | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples:</p> <p>(e.g. elastic and completely inelastic collisions).</p> |
| <p>SC.912.P.12.7:</p> | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples:</p> <p>Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| <p>SC.912.P.12.10:</p> | <p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| <p>SC.912.P.12.11:</p> | <p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> |

| | |
|--|--|
| | <p>Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.</p> |
| <p>SC.912.P.12.12:</p> | <p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| <p>SC.912.L.18.7:</p> | <p>Identify the reactants, products, and basic functions of photosynthesis.</p> |
| <p>SC.912.L.18.8:</p> | <p>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</p> |
| <p>SC.912.L.18.12:</p> | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.N-VM.1.1:</p> | <p>Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., \mathbf{v}, \mathbf{v}, $\ \mathbf{v}\$, v).</p> |
| <p>MAFS.912.N-VM.1.3:</p> | <p>Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>MAFS.912.A-CED.1.4:</p> | <p>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i> ★</p> |

[MAFS.912.F-IF.2.4:](#)

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★

[MAFS.912.F-IF.3.7:](#)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.G-MG.1.2:](#)

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.2:](#)

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.4:](#)

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

[MAFS.912.S-ID.2.5:](#)

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

[MAFS.912.S-ID.2.6:](#)

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess

how well the model fits by analyzing residuals.

[LAFS.910.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

[LAFS.910.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

[LAFS.910.SL.2.4:](#)

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

[LAFS.910.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.910.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

| | |
|------------------------------------|--|
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships |

- between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

| | |
|--|--|
| | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
|--|--|

[LAFS.910.WHST.1.2:](#)

[LAFS.910.WHST.2.4:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.910.WHST.2.5:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

[LAFS.910.WHST.2.6:](#)

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of

| | |
|-------------------------------------|---|
| | technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Physics 1 (#2003380)

Version for Academic Year: 2015 - 2016

Course Number: 2003380

Abbreviated Title: PHYS 1

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices:

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to

support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

[SC.912.N.1.7:](#)

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

[SC.912.N.3.3:](#)

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples: Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |

| | |
|--|--|
| <p>SC.912.E.5.6:</p> | <p>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</p> <p>Remarks/Examples: Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples: Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.10.14:</p> | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| <p>SC.912.P.10.15:</p> | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> |

| | |
|---------------------------------------|--|
| | <p>Remarks/Examples:</p> <p>Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples:</p> <p>Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.3:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

[SC.912.P.10.10:](#)

Remarks/Examples:

Recognize and discuss the effect of each force on the structure of matter and the evidence for it.

Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

[SC.912.P.10.13:](#)

Remarks/Examples:

Using Coulomb's law, determine the force on a stationary charge due to other stationary charges, and explain that this force is many times greater than the gravitational force. Recognize the relationship between forces and their associated potential energies and that the electric field is directly related to the rate of change of the electric potential from point to point in space.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

[SC.912.P.10.18:](#)

Remarks/Examples:

Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

[SC.912.P.10.20:](#)

Remarks/Examples:

Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in

| | |
|--|--|
| | <p>which it propagates.</p> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> |
| <p>SC.912.P.10.22:</p> | <p>Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.</p> <p>Remarks/Examples:</p> <p>Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.</p> |
| <p>SC.912.P.12.1:</p> | <p>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</p> <p>Remarks/Examples:</p> <p>Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).</p> <p>MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.2:</p> | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> <p>Remarks/Examples:</p> <p>Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> |

| | |
|---------------------------------------|--|
| | <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.3:</p> | <p>Interpret and apply Newton's three laws of motion.</p> <p>Remarks/Examples:</p> <p>Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = - F_2 \text{ on } 1$ (Newton's third law).</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples:</p> <p>Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.P.12.5:</p> | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples:</p> <p>(e.g. elastic and completely inelastic collisions).</p> |
| <p>SC.912.P.12.7:</p> | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples:</p> <p>Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| <p>SC.912.P.12.9:</p> | <p>Recognize that time, length, and energy depend on the frame of reference.</p> <p>Remarks/Examples:</p> |

| | |
|------------------------------------|---|
| | The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction). |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ <ul style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| MAFS.912.G-MG.1.2: | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★ |
| MAFS.912.S-ID.1.1: | Represent data with plots on the real number line (dot plots, histograms, and box plots). ★ |

| | |
|---|--|
| | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> |

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.1112.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

[LAFS.1112.RST.1.2:](#)

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

| | |
|-------------------------------------|--|
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax |

| | |
|--|---|
| | <p>to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <ul style="list-style-type: none"> d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.1112.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.1112.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose</p> |

| | |
|--------------------------------------|---|
| | and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Physics 1 Honors (#2003390)

Version for Academic Year: 2015 - 2016

Course Number: 2003390

Abbreviated Title: PHYS 1 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

While the content focus of this course is consistent with the Physics I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in Science</p> </div> |

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific

procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

[SC.912.N.1.5:](#)

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust</p> |

and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and,
MAFS.K12.MP.3: Construct viable arguments and critique

| | |
|-------------------------------|--|
| | the reasoning of others. |
| SC.912.N.3.2: | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| SC.912.N.3.3: | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| SC.912.N.3.4: | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| SC.912.N.3.5: | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.912.N.4.1: | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples: Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.E.5.6:</p> | <p>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</p> <p>Remarks/Examples: Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from</p> |

| | |
|--------------------------------|--|
| | electromagnetic radiation sources. |
| SC.912.P.8.1: | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| SC.912.P.8.3: | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples: Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and “gold foil” experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.912.P.8.4: | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.912.P.10.7: | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as</p> |

| | |
|---------------------------------|---|
| | exothermic (release thermal energy) or endothermic (absorb thermal energy). |
| SC.912.P.10.14: | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| SC.912.P.10.15: | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples: Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| SC.912.P.10.5: | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples: Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| SC.912.P.10.3: | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| SC.912.P.10.1: | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples: Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| SC.912.P.10.2: | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the</p> |

total energy in an isolated system is a conserved quantity.

Remarks/Examples:

Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).

[SC.912.P.10.4:](#)

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

[SC.912.P.10.6:](#)

Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

Remarks/Examples:

Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.

[SC.912.P.10.8:](#)

Explain entropy's role in determining the efficiency of processes that convert energy to work.

Remarks/Examples:

Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.

[SC.912.P.10.10:](#)

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Remarks/Examples:

Recognize and discuss the effect of each force on the structure of matter and the evidence for it.

[SC.912.P.10.13:](#)

Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

Remarks/Examples:

Using Coulomb's law, determine the force on a

| | |
|--|--|
| | <p>stationary charge due to other stationary charges, and explain that this force is many times greater than the gravitational force. Recognize the relationship between forces and their associated potential energies and that the electric field is directly related to the rate of change of the electric potential from point to point in space.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| <p>SC.912.P.10.17:</p> | <p>Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.</p> <p>Remarks/Examples:</p> <p>Recognize that an oscillating charge creates an oscillating electric field which gives rise to electromagnetic waves. Recognize a changing magnetic field makes an electric field, and a changing electric field makes a magnetic field, and these phenomena are expressed mathematically through the Faraday law and the Ampere-Maxwell law.</p> |
| <p>SC.912.P.10.18:</p> | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.10.20:</p> | <p>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</p> |

| | |
|--|--|
| | <p>Remarks/Examples:</p> <p>Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> |
| <p>SC.912.P.10.22:</p> | <p>Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.</p> <p>Remarks/Examples:</p> <p>Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.</p> |
| <p>SC.912.P.12.6:</p> | <p>Qualitatively apply the concept of angular momentum.</p> <p>Remarks/Examples:</p> <p>Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).</p> |
| <p>SC.912.P.12.1:</p> | <p>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</p> <p>Remarks/Examples:</p> <p>Distinguish between vector quantities (e.g., displacement,</p> |

velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).

MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

[SC.912.P.12.2:](#)

Remarks/Examples:

Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.

Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Interpret and apply Newton's three laws of motion.

[SC.912.P.12.3:](#)

Remarks/Examples:

Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_{1 \text{ on } 2} = -F_{2 \text{ on } 1}$ (Newton's third law).

Describe how the gravitational force between two objects depends on their masses and the distance between them.

[SC.912.P.12.4:](#)

Remarks/Examples:

Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.

| | |
|--|--|
| <p>SC.912.P.12.5:</p> | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: (e.g. elastic and completely inelastic collisions).</p> </div> |
| <p>SC.912.P.12.7:</p> | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> </div> |
| <p>SC.912.P.12.8:</p> | <p>Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Recognize that the speed of light in any reference frame is the central postulate of the Special Theory of Relativity. As speeds approach zero, Special Relativity tends towards equivalence with Newton's Laws of Motion.</p> </div> |
| <p>SC.912.P.12.9:</p> | <p>Recognize that time, length, and energy depend on the frame of reference.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction).</p> </div> |
| <p>SC.912.L.18.12:</p> | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |

| | |
|-------------------------------------|---|
| MAFS.912.N-VM.1.1: | Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., \mathbf{v} , $ \mathbf{v} $, $\ \mathbf{v}\ $, v). |
| MAFS.912.N-VM.1.2: | Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.A-CED.1.4: | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i> ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ <ul style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| MAFS.912.G-GMD.1.3: | Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★ |
| MAFS.912.G-MG.1.2: | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★ |
| MAFS.912.S-ID.1.1: | Represent data with plots on the real number line (dot plots, |

| | |
|---|--|
| | <p>histograms, and box plots). ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <p>a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given</i></p> |

functions or choose a function suggested by the context. Emphasize linear, and exponential models.

- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the

| | |
|------------------------------------|---|
| | credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, |

| | |
|--|--|
| | <p>experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> |
| <p>LAFS.1112.RST.4.10:</p> | <p>By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.</p> |
| <p>LAFS.1112.WHST.1.1:</p> | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of |

- the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

| | |
|---|---|
| <u>LAFS.1112.WHST.2.4:</u> | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| <u>LAFS.1112.WHST.2.5:</u> | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| <u>LAFS.1112.WHST.2.6:</u> | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| <u>LAFS.1112.WHST.3.7:</u> | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| <u>LAFS.1112.WHST.3.8:</u> | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| <u>LAFS.1112.WHST.3.9:</u> | Draw evidence from informational texts to support analysis, reflection, and research. |
| <u>LAFS.1112.WHST.4.10:</u> | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and |

instructional purposes within the school setting.

[ELD.K12.ELL.XX.1:](#)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Physics 2 Honors (#2003410)

Version for Academic Year: 2015 - 2016

Course Number: 2003410

Abbreviated Title: PHYS 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to

support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for</p> |

science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of

| | |
|-------------------------------|---|
| | others. |
| SC.912.N.3.3: | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| SC.912.N.3.4: | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| SC.912.N.3.5: | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.912.N.4.1: | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| SC.912.N.4.2: | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> |

| | |
|---------------------------------------|--|
| | <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.9:</p> | <p>Analyze the broad effects of space exploration on the economy and culture of Florida.</p> <p>Remarks/Examples: Recognize the economic, technical and social benefits of spinoff technology developed through the space program.</p> |
| <p>SC.912.E.5.10:</p> | <p>Describe and apply the coordinate system used to locate objects in the sky.</p> <p>Remarks/Examples: Discuss how scientists determine the location of constellations, celestial spheres, and sky maps. Compare and contrast the celestial coordinate system (equatorial system) to the use of latitude and longitude to specify locations on Earth. Recognize the use of right ascension and declination in the location of objects in space, including stars and constellations.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples:</p> |

| | |
|---------------------------------------|---|
| | <p>Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.5.11:</p> | <p>Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.</p> <p>Remarks/Examples: Determine which units of measurement are appropriate to describe distance (e.g. astronomical units, parallax, and light years).</p> <p>Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and MAFS.K12.MP.6: Attend to precision.</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| <p>SC.912.E.7.7:</p> | <p>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</p> <p>Remarks/Examples: Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.</p> |
| <p>SC.912.P.10.9:</p> | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples: Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to</p> |

| | |
|--|---|
| | <p>lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = hv$).</p> |
| <p>SC.912.P.10.12:</p> | <p>Differentiate between chemical and nuclear reactions.</p> <p>Remarks/Examples:</p> <p>Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.8:</p> | <p>Explain entropy's role in determining the efficiency of processes that convert energy to work.</p> <p>Remarks/Examples:</p> <p>Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the</p> |

| | |
|---------------------------------|---|
| | structure of matter and the evidence for it. |
| SC.912.P.10.11: | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| SC.912.P.10.16: | <p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| SC.912.P.10.17: | <p>Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.</p> <p>Remarks/Examples:</p> <p>Recognize that an oscillating charge creates an oscillating electric field which gives rise to electromagnetic waves. Recognize a changing magnetic field makes an electric field, and a changing electric field makes a magnetic field, and these phenomena are expressed mathematically through the Faraday law and the Ampere-Maxwell law.</p> |
| SC.912.P.10.18: | <p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.</p> |
| <p>SC.912.P.10.19:</p> | <p>Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.</p> |
| <p>SC.912.P.10.21:</p> | <p>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</p> <p>Remarks/Examples:</p> <p>Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p> |
| <p>SC.912.P.12.6:</p> | <p>Qualitatively apply the concept of angular momentum.</p> <p>Remarks/Examples:</p> <p>Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).</p> |
| <p>SC.912.P.12.5:</p> | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples:</p> <p>(e.g. elastic and completely inelastic collisions).</p> |
| <p>SC.912.P.12.8:</p> | <p>Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.</p> <p>Remarks/Examples:</p> <p>Recognize that the speed of light in any reference frame is the central postulate of the Special Theory of Relativity. As speeds approach zero, Special Relativity tends towards equivalence with Newton's Laws of Motion.</p> |
| <p>SC.912.P.12.9:</p> | <p>Recognize that time, length, and energy depend on the frame of reference.</p> |

| | |
|------------------------------------|--|
| | <p>Remarks/Examples: The energy E and the momentum p depend on the frame of reference in which they are measured (e.g. Lorentz contraction).</p> |
| SC.912.P.12.10: | <p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples: Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and number of particles in a gas sample (Avogadro's hypothesis).</p> |
| SC.912.L.15.2: | <p>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</p> |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.17.15: | <p>Discuss the effects of technology on environmental quality.</p> |
| SC.912.L.17.11: | <p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</p> |
| SC.912.L.18.12: | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| MAFS.912.N-Q.1.1: | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| MAFS.912.N-Q.1.3: | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| MAFS.912.N-VM.1.1: | <p>Recognize vector quantities as having both magnitude and</p> |

| | |
|------------------------------------|--|
| | direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., \mathbf{v} , $ \mathbf{v} $, $\ \mathbf{v}\ $, v). |
| MAFS.912.N-VM.1.2: | Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. |
| MAFS.912.N-VM.1.3: | Solve problems involving velocity and other quantities that can be represented by vectors. |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★ |
| | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ |
| MAFS.912.F-IF.3.7: | <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| MAFS.912.G-MG.1.2: | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★ |
| | Represent data with plots on the real number line (dot plots, histograms, and box plots). ★ |
| MAFS.912.S-ID.1.1: | <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution,</p> |

| | |
|---|---|
| | <p>such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> |
| <p>MAFS.912.S-ID.1.4:</p> | <p>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</p> |
| <p>MAFS.912.S-ID.2.5:</p> | <p>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</p> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <ol style="list-style-type: none"> Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i> Informally assess the fit of a function by plotting and analyzing residuals. Fit a linear function for a scatter plot that suggests a |

| | |
|------------------------------------|---|
| | <p>linear association.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> </div> |
| MAFS.912.S-IC.2.6: | Evaluate reports based on data. ★ |
| LAFS.1112.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |

| | |
|-------------------------------------|---|
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently |

and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.1112.WHST.1.1:](#)

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to

| | |
|--------------------------------------|---|
| | <p>manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Principles of Technology 1 (#2003600)

Version for Academic Year: 2015 - 2016

Course Number: 2003600

Abbreviated Title: PRINC TECH 1

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support

analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
MAFS.K12.MP.2: Reason abstractly and quantitatively.
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
MAFS.K12.MP.4: Model with mathematics.
MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of

| | |
|--------------------------------------|---|
| | <p>scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples:</p> |

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.3:](#)

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

| | |
|--|--|
| | <p>Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.4:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.10.14:</p> | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| <p>SC.912.P.10.15:</p> | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples: Use Ohm's and Kirchhoff's laws to explain the</p> |

| | |
|--------------------------------|--|
| | relationships among circuits. |
| SC.912.P.10.5: | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples:</p> <p>Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| SC.912.P.10.3: | Compare and contrast work and power qualitatively and quantitatively. |
| SC.912.P.10.1: | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| SC.912.P.10.2: | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| SC.912.P.10.4: | Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. |
| SC.912.P.10.6: | Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum. |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.13:</p> | <p>Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.</p> <p>Remarks/Examples:</p> <p>Using Coulomb's law, determine the force on a stationary charge due to other stationary charges, and explain that this force is many times greater than the gravitational force. Recognize the relationship between forces and their associated potential energies and that the electric field is directly related to the rate of change of the electric potential from point to point in space.</p> |
| <p>SC.912.P.12.1:</p> | <p>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</p> <p>Remarks/Examples:</p> <p>Distinguish between vector quantities (e.g., displacement, velocity, acceleration, force, and linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).</p> <p>MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.2:</p> | <p>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</p> <p>Remarks/Examples:</p> <p>Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time,</p> |

| | |
|--|--|
| | <p>speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.</p> <p>Florida Standards Connections: MAFS.912.N-VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.</p> |
| <p>SC.912.P.12.3:</p> | <p>Interpret and apply Newton's three laws of motion.</p> <p>Remarks/Examples:</p> <p>Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = - F_2 \text{ on } 1$ (Newton's third law).</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples:</p> <p>Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.P.12.5:</p> | <p>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</p> <p>Remarks/Examples: (e.g. elastic and completely inelastic collisions).</p> |
| <p>SC.912.L.17.15:</p> | <p>Discuss the effects of technology on environmental quality.</p> |
| <p>SC.912.L.17.11:</p> | <p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on</p> |

| | |
|-----------------------------------|---|
| | measurement when reporting quantities. ★ |
| LAFS.910.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the |

| | |
|------------------------------------|--|
| | text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and |

| | |
|---|--|
| | <p>evidence, and between claim(s) and counterclaims.</p> <ul style="list-style-type: none"> d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.910.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display</p> |

| | |
|-------------------------------------|---|
| | information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Principles of Technology 2 (#2003610)

Version for Academic Year: 2015 - 2016

Course Number: 2003610

Abbreviated Title: PRINC TECH 2

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support

analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

- MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2: Reason abstractly and quantitatively.
- MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
- MAFS.K12.MP.4: Model with mathematics.
- MAFS.K12.MP.5: Use appropriate tools strategically.
- MAFS.K12.MP.6: Attend to precision.
- MAFS.K12.MP.7: Look for and make use of structure.
- MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of

| | |
|--------------------------------------|---|
| | <p>scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples:</p> |

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

[SC.912.N.3.2:](#)

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.3:](#)

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

| | |
|--------------------------------------|---|
| | <p>Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.9:</p> | <p>Analyze the broad effects of space exploration on the economy and culture of Florida.</p> <p>Remarks/Examples: Recognize the economic, technical and social benefits of spinoff technology developed through the space program.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that</p> |

| | |
|--|--|
| | <p>increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.4:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.10.15:</p> | <p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p>Remarks/Examples: Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.</p> |
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples: Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> |

| | |
|--|---|
| | <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.6:</p> | <p>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</p> <p>Remarks/Examples:</p> <p>Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings.</p> |
| <p>SC.912.P.10.10:</p> | <p>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</p> <p>Remarks/Examples:</p> <p>Recognize and discuss the effect of each force on the structure of matter and the evidence for it.</p> |
| <p>SC.912.P.10.13:</p> | <p>Relate the configuration of static charges to the electric field,</p> |

electric force, electric potential, and electric potential energy.

Remarks/Examples:

Using Coulomb's law, determine the force on a stationary charge due to other stationary charges, and explain that this force is many times greater than the gravitational force. Recognize the relationship between forces and their associated potential energies and that the electric field is directly related to the rate of change of the electric potential from point to point in space.

[SC.912.P.10.16:](#)

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

Remarks/Examples:

Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers.

[SC.912.P.10.17:](#)

Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

Remarks/Examples:

Recognize that an oscillating charge creates an oscillating electric field which gives rise to electromagnetic waves. Recognize a changing magnetic field makes an electric field, and a changing electric field makes a magnetic field, and these phenomena are expressed mathematically through the Faraday law and the Ampere-Maxwell law.

[SC.912.P.10.18:](#)

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Remarks/Examples:

Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.

[SC.912.P.10.20:](#)

Describe the measurable properties of waves and explain the

relationships among them and how these properties change when the wave moves from one medium to another.

Remarks/Examples:

Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.

[SC.912.P.10.21:](#)

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Remarks/Examples:

Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).

[SC.912.P.10.22:](#)

Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

Remarks/Examples:

Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.

[SC.912.P.12.7:](#)

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Remarks/Examples:

Recognize that regardless of the speed of an observer or source, *in a vacuum* the speed of light is always c .

[SC.912.L.17.15:](#)

Discuss the effects of technology on environmental quality.

[SC.912.L.17.11:](#)

Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

[MAFS.912.N-Q.1.1:](#)

Use units as a way to understand problems and to guide the

solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

[MAFS.912.N-Q.1.3:](#)

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.910.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

[LAFS.910.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

[LAFS.910.SL.2.4:](#)

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

[LAFS.910.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

| | |
|------------------------------------|---|
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level |

| | |
|---|--|
| | <p>and concerns.</p> <ul style="list-style-type: none"> c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and</p> |

| | |
|-------------------------------------|---|
| | audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Solar Energy Honors (#2002540)

Version for Academic Year: 2015 - 2016

Course Number: 2002540

Abbreviated Title: SOLAR ENERGY HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Elective

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into

words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same

outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.1.7:](#)

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.2:](#)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|---|
| | <p>Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |

| | |
|--------------------------------------|---|
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.4:</p> | <p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p>Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.6.6:</p> | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which</p> |

| | |
|--------------------------------|--|
| | are driven by energy from within the Earth and from the Sun. |
| SC.912.E.7.2: | <p>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</p> <p>Remarks/Examples: Explain how surface and deep-water circulation patterns (Coriolis effect, La Niña, El Niño, Southern Oscillation, upwelling, ocean surface cooling, freshwater influx, density differences, Labrador Current and Gulf Stream) impact energy transfer in the environment.</p> |
| SC.912.E.7.9: | <p>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</p> <p>Remarks/Examples: Explain how the oceans act as sources/sinks of heat energy, store carbon dioxide mostly as dissolved HCO_3^- and CaCO_3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.</p> |
| SC.912.P.8.12: | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| SC.912.P.8.13: | <p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p>Remarks/Examples: Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).</p> |
| SC.912.P.10.9: | <p>Describe the quantization of energy at the atomic level.</p> <p>Remarks/Examples:</p> |

| | |
|--|--|
| | <p>Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship $E = hv$).</p> |
| <p>SC.912.P.10.3:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.L.17.15:</p> | <p>Discuss the effects of technology on environmental quality.</p> |
| <p>SC.912.L.17.17:</p> | <p>Assess the effectiveness of innovative methods of protecting</p> |

| | |
|------------------------------------|---|
| | the environment. |
| | Discuss the political, social, and environmental consequences of sustainable use of land. |
| SC.912.L.17.12: | <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated.</p> |
| SC.912.L.17.18: | Describe how human population size and resource use relate to environmental quality. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. |
| SC.912.L.17.16: | <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| SC.912.L.17.19: | Describe how different natural resources are produced and how their rates of use and renewal limit availability. |
| | Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability. |
| SC.912.L.17.20: | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given |

| | |
|---|---|
| | <p>a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| <p>MAFS.912.S-ID.1.1:</p> | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.2:</p> | <p>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context</p> |

of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

[MAFS.912.S-ID.2.6:](#)

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.1112.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

[LAFS.1112.RST.1.2:](#)

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

[LAFS.1112.RST.1.3:](#)

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

[LAFS.1112.RST.2.4:](#)

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

| | |
|-------------------------------------|---|
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows |

| | |
|-------------------------------------|---|
| | from or supports the argument presented. |
| | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| LAFS.1112.WHST.1.2: | |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating |

| | |
|--------------------------------------|---|
| | understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Solar Energy 2 Honors (#2002550)

Version for Academic Year: 2015 - 2016

Course Number: 2002550

Abbreviated Title: SOLAR ENERGY 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Elective

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

VERSION DESCRIPTION

This course is designed to educate students more specifically on the generation of heat from solar energy. Building on concepts from Solar Energy Honors, this course will focus largely on fluid mechanics and heat transfer in solar thermal systems (pool, space, and water heating), especially types of collectors, properties of suitable materials for collectors, open and closed loop systems, and types of heat storage. The course covers scientific, economic, and global impact analysis of current energy methods and new solar energy technologies for the generation of energy from heat, as well as careers in various areas of solar energy. Students will be guided through the process of certification for a solar energy technician.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

GENERAL NOTES

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Career and Technical Education: Solar Energy Technician

19.01 Define basic solar terms (e.g., irradiation, Langley, azimuth)

19.05 Describe angular effects on the irradiance of array

19.06 Identify factors that reduce/enhance solar irradiation

19.07 Determine average solar irradiation on various surfaces

19.08 Describe how a photovoltaic solar cell works

19.09 Draw and label a diagram of PV cells

19.10 Explain the differences between monocrystalline, polycrystalline, thin-film, and nano-solar cells

20.02 Identify personal and environmental safety hazards and acceptable practices

21.08 Estimate the peak load and average energy use in order to determine the size and amount of solar equipment needed

22.05 Select appropriate conductor types and rating for each electrical circuit in the open

or closed system

22.09 Determine voltage drop for any electrical circuit based on size and length of conductors

29.01 Discuss the role of creativity in constructing scientific questions, methods, and explanations.

29.02 Formulate scientifically investigatable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.

31.04 Conduct technical research to gather information necessary for decision-making

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).3. Examine books and other sources of information to see what is already known,4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).5. Plan investigations, (Design and evaluate a scientific investigation).6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).7. Pose answers, explanations, or descriptions of events,8. Generate explanations that explicate or describe natural phenomena (inferences),9. Use appropriate evidence and reasoning to justify these explanations to others,10. Communicate results of scientific investigations, and11. Evaluate the merits of the explanations produced by |

others.

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and

media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for

| | |
|--------------------------------------|--|
| | <p>inconsistent results, such as sources of error or uncontrolled conditions.</p> <p>Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others</p> |
| <p>SC.912.N.1.4:</p> | <p>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</p> <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and</p> |

| | |
|--------------------------------------|--|
| | <p>critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it</p> |

is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and,
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

Remarks/Examples:

Describe how models are used by scientists to explain observations of nature.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.N.4.1:](#)

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.N.4.2:](#)

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

[SC.912.E.5.4:](#)

Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

Remarks/Examples:

Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun

| | |
|---------------------------------|--|
| | as the main source of external energy for the Earth. |
| SC.912.E.6.6: | <p>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</p> <p>Remarks/Examples: Investigate and discuss how humans affect and are affected by geological systems and processes by describing the possible long-term consequences (costs and benefits) that increased human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining) has placed on the environment (e.g. pollution, health, habitat destruction) and the impact on future energy production.</p> |
| SC.912.E.7.1: | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| SC.912.P.8.12: | <p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</p> <p>Remarks/Examples: Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.</p> |
| SC.912.P.10.14: | <p>Differentiate among conductors, semiconductors, and insulators.</p> <p>Remarks/Examples: Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.</p> |
| SC.912.P.10.5: | Relate temperature to the average molecular kinetic energy. |

| | |
|---------------------------------------|--|
| | <p>Remarks/Examples:</p> <p>Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.3:</p> | <p>Compare and contrast work and power qualitatively and quantitatively.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples:</p> <p>Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.8:</p> | <p>Explain entropy's role in determining the efficiency of processes that convert energy to work.</p> <p>Remarks/Examples:</p> <p>Recognize that there is a natural tendency for systems to</p> |

| | |
|-----------------------------------|---|
| | <p>move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.</p> |
| SC.912.L.17.15: | Discuss the effects of technology on environmental quality. |
| SC.912.L.17.17: | Assess the effectiveness of innovative methods of protecting the environment. |
| SC.912.L.17.18: | Describe how human population size and resource use relate to environmental quality. |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| SC.912.L.17.16: | <p>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</p> <p>Remarks/Examples: Integrate HE.912.C.1.3. Evaluate how environment and personal health are interrelated and, HE.912.C.1.5. Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| SC.912.L.17.20: | <p>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.</p> |
| SS.912.W.9.1: | <p>Identify major scientific figures and breakthroughs of the 20th century, and assess their impact on contemporary life.</p> <p>Remarks/Examples: Examples are Marie Curie, Albert Einstein, Enrico Fermi, Sigmund Freud, Wright Brothers, Charles R. Drew, mass vaccination, atomic energy, transistor, microchip, space exploration, Internet, discovery of DNA, Human Genome Project.</p> |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

[MAFS.912.F-IF.3.7:](#)

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

| | |
|------------------------------------|---|
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and |

| | |
|-------------------------------------|--|
| | corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. |

- f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

[LAFS.910.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

Write arguments focused on *discipline-specific content*.

[LAFS.1112.WHST.1.1:](#)

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.1112.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and

| | |
|---|--|
| | <p>examples appropriate to the audience’s knowledge of the topic.</p> <ul style="list-style-type: none"> c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.1112.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.1112.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.1112.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.</p> |
| <p>LAFS.1112.WHST.3.7:</p> | <p>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> |
| <p>LAFS.1112.WHST.3.8:</p> | <p>Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> |
| <p>LAFS.1112.WHST.3.9:</p> | <p>Draw evidence from informational texts to support analysis, reflection, and research.</p> |
| <p>LAFS.1112.WHST.4.10:</p> | <p>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</p> |

| | |
|--|--|
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and instructional purposes within the school setting. |
| <u>ELD.K12.ELL.XX.1:</u> | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Space Technology and Engineering (#2002330)

Version for Academic Year: 2015 - 2016

Course Number: 2002330

Abbreviated Title: SPACE TECH ENG

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed

visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples:</p> |

| | |
|--------------------------------------|---|
| | <p>Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> |

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.E.5.11:</p> | <p>Distinguish the various methods of measuring astronomical</p> |

distances and apply each in appropriate situations.

Remarks/Examples:

Determine which units of measurement are appropriate to describe distance (e.g. astronomical units, parallax, and light years).

Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and MAFS.K12.MP.6: Attend to precision.

Relate the formation of severe weather to the various physical factors.

[SC.912.E.7.6:](#)

Remarks/Examples:

Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods, thunderstorms, and drought).

Differentiate among conductors, semiconductors, and insulators.

[SC.912.P.10.14:](#)

Remarks/Examples:

Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

[SC.912.P.10.15:](#)

Remarks/Examples:

Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

[SC.912.P.10.1:](#)

Remarks/Examples:

Differentiate between kinetic and potential energy.
Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy:
Heat to light in incandescent electric light bulbs
Light to heat in laser drills
Electrical to sound in radios
Sound to electrical in microphones
Electrical to chemical in battery rechargers
Chemical to electrical in dry cells
Mechanical to electrical in generators [power plants]

| | |
|--|---|
| | <p>Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.</p> |
| <p>SC.912.P.10.2:</p> | <p>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</p> <p>Remarks/Examples:</p> <p>Use calorimetry to illustrate conservation of energy. Differentiate between the different types of systems and solve problems involving conservation of energy in simple systems (Physics). Explain how conservation of energy is important in chemical reactions with bond formation and bond breaking (Chemistry).</p> |
| <p>SC.912.P.10.4:</p> | <p>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</p> |
| <p>SC.912.P.10.11:</p> | <p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p> <p>Remarks/Examples:</p> <p>Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation $E=mc^2$.</p> |
| <p>SC.912.P.10.16:</p> | <p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p>Remarks/Examples:</p> <p>Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize the Lorentz force is the force on a point charge</p> |

| | |
|--|--|
| | <p>due to electromagnetic fields and occurs in many devices, including mass spectrometers.</p> |
| <p>SC.912.P.10.19:</p> | <p>Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.</p> |
| <p>SC.912.P.12.3:</p> | <p>Interpret and apply Newton's three laws of motion.</p> <p>Remarks/Examples:</p> <p>Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = - F_1 \text{ on } 1$ (Newton's third law).</p> |
| <p>SC.912.P.12.4:</p> | <p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples:</p> <p>Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.</p> |
| <p>SC.912.P.12.7:</p> | <p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples:</p> <p>Recognize that regardless of the speed of an observer or source, <i>in a vacuum</i> the speed of light is always c.</p> |
| <p>SC.912.P.12.8:</p> | <p>Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.</p> <p>Remarks/Examples:</p> <p>Recognize that the speed of light in any reference frame is the central postulate of the Special Theory of Relativity. As speeds approach zero, Special Relativity tends towards</p> |

equivalence with Newton's Laws of Motion.

[MAFS.912.N-Q.1.1:](#)

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

[MAFS.912.N-Q.1.3:](#)

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

[MAFS.912.F-IF.3.7:](#)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[LAFS.910.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into

| | |
|-------------------------------------|--|
| | <p>the discussion; and clarify, verify, or challenge ideas and conclusions.</p> <p>d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.</p> |
| LAFS.910.SL.1.1d: | Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and |

| | |
|------------------------------------|---|
| | technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| | Write arguments focused on <i>discipline-specific content</i> . |
| LAFS.910.WHST.1.1: | <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. |

- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

| | |
|---|--|
| <p>LAFS.910.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
|---|--|

| | |
|---|---|
| <p>LAFS.910.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
|---|---|

| | |
|---|---|
| <p>LAFS.910.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
|---|---|

[LAFS.910.WHST.2.6:](#)

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

[LAFS.910.WHST.3.7:](#)

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

[LAFS.910.WHST.3.8:](#)

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

[LAFS.910.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

[LAFS.910.WHST.4.10:](#)

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

[LAFS.1112.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

| | |
|-------------------------------------|---|
| | e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Zoology (#2000410)

Version for Academic Year: 2015 - 2016

Course Number: 2000410

Abbreviated Title: ZOOLOGY

Number of Credits: One credit (1)

Course Length: Year (Y)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis: 1. Ensuring wide reading from complex text that varies in length. 2. Making close reading and rereading of texts central to lessons. 3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence. 4. Emphasizing students supporting answers based upon evidence from the text. 5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a

relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). |

6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational

texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

| | |
|--|---|
| | <p>Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.L.14.12:</p> | <p>Describe the anatomy and histology of bone tissue.</p> |
| <p>SC.912.L.14.5:</p> | <p>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</p> |
| <p>SC.912.L.14.26:</p> | <p>Identify the major parts of the brain on diagrams or models.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.L.14.36:</p> | <p>Describe the factors affecting blood flow through the cardiovascular system.</p> |
| <p>SC.912.L.14.44:</p> | <p>Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation.</p> |
| <p>SC.912.L.14.50:</p> | <p>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</p> |
| <p>SC.912.L.14.51:</p> | <p>Describe the function of the vertebrate integumentary system.</p> |

| | |
|--|--|
| <p>SC.912.L.15.1:</p> | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> </div> |
| <p>SC.912.L.15.3:</p> | <p>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</p> |
| <p>SC.912.L.15.4:</p> | <p>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</p> |
| <p>SC.912.L.15.5:</p> | <p>Explain the reasons for changes in how organisms are classified.</p> |
| <p>SC.912.L.15.6:</p> | <p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> </div> |
| <p>SC.912.L.15.7:</p> | <p>Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.</p> |
| <p>SC.912.L.15.11:</p> | <p>Discuss specific fossil hominids and what they show about human evolution.</p> |
| <p>SC.912.L.15.13:</p> | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> </div> |
| <p>SC.912.L.15.14:</p> | <p>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</p> |
| <p>SC.912.L.15.15:</p> | <p>Describe how mutation and genetic recombination increase genetic variation.</p> |
| <p>SC.912.L.17.7:</p> | <p>Characterize the biotic and abiotic components that define</p> |

| | |
|------------------------------------|---|
| | freshwater systems, marine systems and terrestrial systems. |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1 . |
| SC.912.L.18.1: | Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11 . |
| SC.912.L.18.9: | Explain the interrelated nature of photosynthesis and cellular respiration. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10 . |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.3.7: | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. |

| | |
|---|---|
| | <ul style="list-style-type: none"> d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| <p>LAFS.910.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| <p>LAFS.910.SL.1.2:</p> | <p>Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.</p> |
| <p>LAFS.910.SL.1.3:</p> | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.</p> |
| <p>LAFS.910.SL.2.4:</p> | <p>Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</p> |

[LAFS.910.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.1112.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical,

| | |
|-------------------------------------|---|
| | audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the |

| | |
|------------------------------------|--|
| | text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |

Write arguments focused on *discipline-specific content*.

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.1112.WHST.1.1:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a

[LAFS.1112.WHST.1.2:](#)

| | |
|--------------------------------------|---|
| | <p>knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

M/J Life Science, Advanced (#2000020)

Version for Academic Year: 2015 - 2016

Course Number: 2000020

Abbreviated Title: M/J LIF SCI ADV

Course Length: Year (Y)

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 6,7,8

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that

allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the seventh grade course, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

| Name | Description |
|-----------------------------|--|
| SC.6.N.1.2: | Explain why scientific investigations should be replicable. |
| SC.6.N.1.1: | Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. |
| | <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> </div> |

| | |
|------------------------------------|--|
| | <p>Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> |
| <p>SC.6.N.1.3:</p> | <p>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</p> <p>Remarks/Examples: Explain that an investigation is observing or studying the natural world, without interference or manipulation, and an experiment is an investigation that involves variables (independent/manipulated and dependent/ outcome) and establishes cause-and-effect relationships (Schwartz, 2007).</p> |
| <p>SC.6.N.1.4:</p> | <p>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</p> |
| <p>SC.6.N.1.5:</p> | <p>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</p> <p>Remarks/Examples: Florida Standards Connections: LAFS.68.RST.3.7 LAFS.68.WHST.1.2 and, LAFS.68.WHST.3.9.</p> |
| <p>SC.6.N.2.1:</p> | <p>Distinguish science from other activities involving thought.</p> <p>Remarks/Examples: Thought refers to any mental or intellectual activity involving an individual's subjective consciousness. Science is a systematic process that pursues, builds and organizes knowledge in the form of testable explanations and predictions about the natural world.</p> |
| <p>SC.6.N.2.2:</p> | <p>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</p> |
| <p>SC.6.N.2.3:</p> | <p>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</p> |
| <p>SC.6.N.3.3:</p> | <p>Give several examples of scientific laws.</p> |
| <p>SC.6.N.3.4:</p> | <p>Identify the role of models in the context of the sixth grade science benchmarks.</p> <p>Remarks/Examples:</p> |

| | |
|------------------------------|--|
| | Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.6.N.3.1: | Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life. |
| SC.6.N.3.2: | Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws. |
| SC.6.L.14.1: | Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms. |
| | Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.6.L.14.2: | Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life. |
| SC.6.L.14.3: | Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing. |
| SC.6.L.14.4: | Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles. |
| | Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.6.L.14.5: | Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis. |
| SC.6.L.14.6: | Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites. |
| | Remarks/Examples: Integrate HE.6.C.1.8 . Explain how body systems are impacted by hereditary factors and infectious agents. |

| | |
|------------------------------|--|
| SC.6.L.15.1: | Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains. |
| SC.7.N.1.2: | Differentiate replication (by others) from repetition (multiple trials). |
| SC.7.N.1.1: | Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. |
| | <p>Remarks/Examples:</p> <p>Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> |
| SC.7.N.1.3: | Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation. |
| SC.7.N.1.4: | Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment. |
| SC.7.N.1.5: | Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics. |
| SC.7.N.1.6: | Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based. |
| SC.7.N.1.7: | Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community. |
| SC.7.N.2.1: | Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered. |
| SC.7.N.3.2: | Identify the benefits and limitations of the use of scientific models. |
| | <p>Remarks/Examples:</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.7.N.3.1: | Recognize and explain the difference between theories and laws |

| | |
|------------------------------|--|
| | and give several examples of scientific theories and the evidence that supports them. |
| SC.7.L.15.1: | Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species. |
| SC.7.L.15.2: | Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms. |
| SC.7.L.15.3: | Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species. |
| SC.7.L.16.1: | Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another. |
| | <p>Remarks/Examples: Integrate HE.7.C.1.4. Describe how heredity can affect personal health.</p> |
| SC.7.L.16.2: | Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees. |
| SC.7.L.16.3: | Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis. |
| SC.7.L.16.4: | Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment. |
| | <p>Remarks/Examples: Integrate HE.7.C.1.4. Describe how heredity can affect personal health.</p> |
| SC.7.L.17.1: | Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web. |
| SC.7.L.17.2: | Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism. |
| SC.7.L.17.3: | Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites. |
| SC.8.N.1.1: | Define a problem from the eighth grade curriculum using |

| | |
|-----------------------------|--|
| | appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. |
| SC.8.N.1.2: | Design and conduct a study using repeated trials and replication. |
| SC.8.N.1.3: | Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim. |
| SC.8.N.1.4: | Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data. |
| SC.8.N.1.5: | Analyze the methods used to develop a scientific explanation as seen in different fields of science. |
| SC.8.N.1.6: | Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.8.N.2.1: | Distinguish between scientific and pseudoscientific ideas. Remarks/Examples: Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations (e.g. astrology is pseudoscience). |
| SC.8.N.2.2: | Discuss what characterizes science and its methods. Remarks/Examples: Science is the systematic, organized inquiry that is derived from observations and experimentation that can be verified through testing to explain natural phenomena. |
| SC.8.N.3.1: | Select models useful in relating the results of their own investigations. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.8.N.3.2: | Explain why theories may be modified but are rarely discarded. |

| | |
|---------------------------------|--|
| SC.8.N.4.2: | Explain how political, social, and economic concerns can affect science, and vice versa. |
| SC.8.N.4.1: | Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels. |
| SC.8.L.18.1: | Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen. |
| SC.8.L.18.2: | Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide. |
| SC.8.L.18.3: | Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.8.L.18.4: | Cite evidence that living systems follow the Laws of Conservation of Mass and Energy. |
| SC.912.L.14.2: | Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport). |
| SC.912.L.14.3: | Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells. Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.14.2 . |
| SC.912.L.15.6: | Discuss distinguishing characteristics of the domains and kingdoms of living organisms. Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6 . |
| SC.912.L.15.13: | Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success. Remarks/Examples: Annually assessed on Biology EOC. Also assesses |

[SC.912.L.15.14](#), [SC.912.L.15.15](#), and [SC.912.N.1.3](#).

[SC.912.L.16.2:](#)

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

[SC.912.L.16.14:](#)

Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

[SC.912.L.16.16:](#)

Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.

[SC.912.L.17.6:](#)

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

[SC.912.L.17.9:](#)

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Remarks/Examples:

Annually assessed on Biology EOC. Also assesses [SC.912.E.7.1](#).

[SC.912.L.18.7:](#)

Identify the reactants, products, and basic functions of photosynthesis.

[SC.912.L.18.8:](#)

Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

Explain the interrelated nature of photosynthesis and cellular respiration.

[SC.912.L.18.9:](#)

Remarks/Examples:

Annually assessed on Biology EOC. Also assesses [SC.912.L.18.7](#) [SC.912.L.18.8](#) [SC.912.L.18.10](#).

[MAFS.6.EE.3.9:](#)

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.*

| | |
|---------------------------------|---|
| MAFS.6.SP.2.4: | Display numerical data in plots on a number line, including dot plots, histograms, and box plots. |
| MAFS.6.SP.2.5: | Summarize numerical data sets in relation to their context, such as by: <ul style="list-style-type: none"> a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. |
| MAFS.6.SP.2.5a: | a. Reporting the number of observations. |
| MAFS.6.SP.2.5b: | b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. |
| MAFS.6.SP.2.5c: | c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. |
| MAFS.7.SP.2.4: | Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i> |
| MAFS.7.SP.3.5: | Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. |
| LAFS.7.SL.1.2: | Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. |
| LAFS.7.SL.1.3: | Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of |

| | |
|-----------------------------------|--|
| | the evidence. |
| LAFS.7.SL.2.4: | Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. |
| LAFS.7.SL.2.5: | Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. |
| LAFS.68.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts. |
| LAFS.68.RST.1.2: | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. |
| LAFS.68.RST.1.3: | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| LAFS.68.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. |
| LAFS.68.RST.2.5: | Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. |
| LAFS.68.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. |
| LAFS.68.RST.3.7: | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |
| LAFS.68.RST.3.8: | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. |
| LAFS.68.RST.3.9: | Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. |
| LAFS.68.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows |

| | |
|-----------------------------------|---|
| | from and supports the argument presented. |
| LAFS.68.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. |
| LAFS.68.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.68.WHST.2.5: | With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. |
| LAFS.68.WHST.2.6: | Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. |
| LAFS.68.WHST.3.7: | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LAFS.68.WHST.3.8: | Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. |
| LAFS.68.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |

| | |
|------------------------------------|---|
| LAFS.68.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| HE.6.C.1.8: | Examine the likelihood of injury or illness if engaging in unhealthy/risky behaviors. Remarks/Examples: Obesity related to poor nutrition and inactivity, cancer and chronic lung disease related to tobacco use, injuries caused from failure to use seat restraint, and sexually transmitted diseases caused by sexual activity. |
| HE.7.C.1.3: | Analyze how environmental factors affect personal health. Remarks/Examples: Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection. |
| HE.7.C.1.7: | Describe how heredity can affect personal health. Remarks/Examples: Sickle-cell anemia, diabetes, and acne. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |
| LAFS.7.SL.1.1a: | Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. |
| LAFS.7.SL.1.1b: | Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. |
| LAFS.7.SL.1.1c: | Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. |
| LAFS.7.SL.1.1d: | Acknowledge new information expressed by others and, when warranted, modify their own views. |

M/J Physical Science (#2003010)

Version for Academic Year: 2015 - 2016

Course Number: 2003010

Abbreviated Title: M/J PHY SCI

Course Length: Year (Y)

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 6,7,8

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English

language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

| Name | Description |
|-----------------------------|---|
| SC.6.N.1.2: | Explain why scientific investigations should be replicable. |
| SC.6.N.1.1: | Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out</p> </div> |

| | |
|------------------------------------|--|
| | <p>experiments, taking measurements, or performing technical tasks.</p> |
| <p>SC.6.N.1.3:</p> | <p>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</p> <p>Remarks/Examples: Explain that an investigation is observing or studying the natural world, without interference or manipulation, and an experiment is an investigation that involves variables (independent/manipulated and dependent/ outcome) and establishes cause-and-effect relationships (Schwartz, 2007).</p> |
| <p>SC.6.N.1.4:</p> | <p>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</p> |
| <p>SC.6.N.1.5:</p> | <p>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</p> <p>Remarks/Examples: Florida Standards Connections: LAFS.68.RST.3.7 LAFS.68.WHST.1.2 and, LAFS.68.WHST.3.9.</p> |
| <p>SC.6.N.2.1:</p> | <p>Distinguish science from other activities involving thought.</p> <p>Remarks/Examples: Thought refers to any mental or intellectual activity involving an individual's subjective consciousness. Science is a systematic process that pursues, builds and organizes knowledge in the form of testable explanations and predictions about the natural world.</p> |
| <p>SC.6.N.2.2:</p> | <p>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</p> |
| <p>SC.6.N.2.3:</p> | <p>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</p> |
| <p>SC.6.N.3.3:</p> | <p>Give several examples of scientific laws.</p> |
| <p>SC.6.N.3.4:</p> | <p>Identify the role of models in the context of the sixth grade science benchmarks.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |

| | |
|-------------------------------------|---|
| <u>SC.6.N.3.1:</u> | Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life. |
| <u>SC.6.N.3.2:</u> | Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws. |
| <u>SC.6.P.11.1:</u> | Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa. |
| <u>SC.6.P.12.1:</u> | <p>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.</p> </div> |
| <u>SC.6.P.13.1:</u> | Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational. |
| <u>SC.6.P.13.2:</u> | Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are. |
| <u>SC.6.P.13.3:</u> | Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both. |
| <u>SC.7.N.1.2:</u> | Differentiate replication (by others) from repetition (multiple trials). |
| <u>SC.7.N.1.1:</u> | <p>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> </div> |
| <u>SC.7.N.1.3:</u> | Distinguish between an experiment (which must involve the |

| | |
|------------------------------|--|
| | identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation. |
| SC.7.N.1.4: | Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment. |
| SC.7.N.1.5: | Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics. |
| SC.7.N.1.6: | Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based. |
| SC.7.N.1.7: | Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community. |
| SC.7.N.2.1: | Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered. |
| SC.7.N.3.2: | Identify the benefits and limitations of the use of scientific models. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> </div> |
| SC.7.N.3.1: | Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them. |
| SC.7.P.10.2: | Observe and explain that light can be reflected, refracted, and/or absorbed. |
| SC.7.P.10.1: | Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. |
| SC.7.P.10.3: | Recognize that light waves, sound waves, and other waves move at different speeds in different materials. |
| SC.7.P.11.2: | Investigate and describe the transformation of energy from one form to another. |
| SC.7.P.11.1: | Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state. |
| SC.7.P.11.3: | Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another. |
| SC.7.P.11.4: | Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature. |

| | |
|-----------------------------|--|
| SC.8.N.1.1: | <p>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</p> |
| SC.8.N.1.2: | <p>Design and conduct a study using repeated trials and replication.</p> |
| SC.8.N.1.3: | <p>Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.</p> |
| SC.8.N.1.4: | <p>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</p> |
| SC.8.N.1.5: | <p>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</p> |
| SC.8.N.1.6: | <p>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> </div> |
| SC.8.N.2.1: | <p>Distinguish between scientific and pseudoscientific ideas.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations (e.g. astrology is pseudoscience).</p> </div> |
| SC.8.N.2.2: | <p>Discuss what characterizes science and its methods.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Science is the systematic, organized inquiry that is derived from observations and experimentation that can be verified through testing to explain natural phenomena.</p> </div> |
| SC.8.N.3.1: | <p>Select models useful in relating the results of their own investigations.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> </div> |

| | |
|-----------------------------|--|
| SC.8.N.3.2: | Explain why theories may be modified but are rarely discarded. |
| SC.8.N.4.2: | Explain how political, social, and economic concerns can affect science, and vice versa. |
| SC.8.N.4.1: | Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels. |
| SC.8.P.8.1: | <p>Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.</p> <div style="border: 1px solid black; padding: 10px;"> <p>Remarks/Examples: Recognize that matter is composed of discrete units called atoms and atoms are composed of sub-atomic particles called protons, neutrons, and electrons. Solid is the state in which intermolecular attractions keep the molecules in fixed spatial relationships. Liquid is the state in which intermolecular attractions keep molecules in proximity, but not in fixed relationships. Gas is the state in which molecules are comparatively separated and intermolecular attractions have relatively little effect on their respective motions.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> </div> |
| SC.8.P.8.2: | Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass. |
| SC.8.P.8.3: | <p>Explore and describe the densities of various materials through measurement of their masses and volumes.</p> <div style="border: 1px solid black; padding: 10px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.</p> </div> |
| SC.8.P.8.4: | <p>Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.</p> <div style="border: 1px solid black; padding: 10px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.</p> </div> |

| | |
|---------------------------------------|--|
| <p>SC.8.P.8.5:</p> | <p>Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.</p> <p>Remarks/Examples: Demonstrate with atomic models how atoms can combine in many ways. Explain why there are many, but limited, combinations. Use models to demonstrate the conservation of mass in modeled chemical reactions.</p> |
| <p>SC.8.P.8.6:</p> | <p>Recognize that elements are grouped in the periodic table according to similarities of their properties.</p> |
| <p>SC.8.P.8.7:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.8.P.8.9:</p> | <p>Distinguish among mixtures (including solutions) and pure substances.</p> <p>Remarks/Examples: Pure substances include elements and compounds. Mixtures are classified as heterogeneous (mixtures) or homogeneous (solutions). Methods for separating mixtures include: distillation, chromatography, reverse osmosis, diffusion through semi-permeable membranes.</p> |
| <p>SC.8.P.8.8:</p> | <p>Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.</p> |
| <p>SC.8.P.9.2:</p> | <p>Differentiate between physical changes and chemical changes.</p> |
| <p>SC.8.P.9.3:</p> | <p>Investigate and describe how temperature influences chemical changes.</p> |
| <p>SC.8.P.9.1:</p> | <p>Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.</p> |
| <p>MAFS.6.SP.2.5:</p> | <p>Summarize numerical data sets in relation to their context, such as by:</p> <ol style="list-style-type: none"> Reporting the number of observations. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. |

- c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

[MAFS.7.SP.2.4:](#)

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

[MAFS.7.SP.3.5:](#)

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

[MAFS.8.F.2.5:](#)

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

[MAFS.8.G.3.9:](#)

Remarks/Examples:

Fluency Expectations or Examples of Culminating Standards

When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

[LAFS.8.SL.1.1:](#)

Engage effectively in a range of collaborative discussions (one-

| | |
|----------------------------------|--|
| | <p>on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented. |
| LAFS.8.SL.1.2: | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| LAFS.8.SL.1.3: | Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced. |
| LAFS.8.SL.2.4: | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. |
| LAFS.8.SL.2.5: | Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. |
| LAFS.68.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts. |
| LAFS.68.RST.1.2: | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. |
| LAFS.68.RST.1.3: | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| LAFS.68.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. |
| LAFS.68.RST.2.5: | Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an |

| | |
|-----------------------------------|--|
| | understanding of the topic. |
| LAFS.68.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. |
| LAFS.68.RST.3.7: | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |
| LAFS.68.RST.3.8: | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. |
| LAFS.68.RST.3.9: | Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. |
| LAFS.68.RST.4.10: | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. |
| LAFS.68.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented. |
| LAFS.68.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. |

| | |
|------------------------------------|---|
| | <ul style="list-style-type: none"> e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. |
| LAFS.68.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.68.WHST.2.5: | With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. |
| LAFS.68.WHST.2.6: | Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. |
| LAFS.68.WHST.3.7: | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LAFS.68.WHST.3.8: | Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. |
| LAFS.68.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.68.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

M/J Physical Science, Advanced (#2003020)

Version for Academic Year: 2015 - 2016

Course Number: 2003020

Abbreviated Title: M/J PHY SCI ADV

Course Length: Year (Y)

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 6,7,8

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that

allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

| Name | Description |
|------------------------------|---|
| SC.6.P.11.1: | Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa. |
| SC.6.P.12.1: | Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend</p> </div> |

| | |
|------------------------------|--|
| | to precision. |
| SC.6.P.13.1: | Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational. |
| SC.6.P.13.2: | Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are. |
| SC.6.P.13.3: | Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both. |
| SC.7.N.1.2: | Differentiate replication (by others) from repetition (multiple trials). |
| SC.7.N.1.1: | <p>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> </div> |
| SC.7.N.1.3: | Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation. |
| SC.7.N.1.4: | Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment. |
| SC.7.N.1.5: | Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics. |
| SC.7.N.1.6: | Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based. |
| SC.7.N.1.7: | Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community. |
| SC.7.N.2.1: | Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new |

| | |
|------------------------------|---|
| | interpretations are encountered. |
| SC.7.N.3.2: | Identify the benefits and limitations of the use of scientific models. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.7.N.3.1: | Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them. |
| SC.7.P.10.2: | Observe and explain that light can be reflected, refracted, and/or absorbed. |
| SC.7.P.10.1: | Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. |
| SC.7.P.10.3: | Recognize that light waves, sound waves, and other waves move at different speeds in different materials. |
| SC.7.P.11.2: | Investigate and describe the transformation of energy from one form to another. |
| SC.7.P.11.1: | Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state. |
| SC.7.P.11.3: | Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another. |
| SC.7.P.11.4: | Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature. |
| SC.8.N.1.1: | Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. |
| SC.8.N.1.2: | Design and conduct a study using repeated trials and replication. |
| SC.8.N.1.3: | Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim. |
| SC.8.N.1.4: | Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data. |
| SC.8.N.1.5: | Analyze the methods used to develop a scientific explanation as seen in different fields of science. |

| | |
|------------------------------------|--|
| <p>SC.8.N.1.6:</p> | <p>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.8.N.2.1:</p> | <p>Distinguish between scientific and pseudoscientific ideas.</p> <p>Remarks/Examples: Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations (e.g. astrology is pseudoscience).</p> |
| <p>SC.8.N.2.2:</p> | <p>Discuss what characterizes science and its methods.</p> <p>Remarks/Examples: Science is the systematic, organized inquiry that is derived from observations and experimentation that can be verified through testing to explain natural phenomena.</p> |
| <p>SC.8.N.3.1:</p> | <p>Select models useful in relating the results of their own investigations.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.8.N.3.2:</p> | <p>Explain why theories may be modified but are rarely discarded.</p> |
| <p>SC.8.N.4.2:</p> | <p>Explain how political, social, and economic concerns can affect science, and vice versa.</p> |
| <p>SC.8.N.4.1:</p> | <p>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</p> |
| <p>SC.8.P.8.1:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.</p> <p>Remarks/Examples: Recognize that matter is composed of discrete units called atoms and atoms are composed of sub-atomic particles called protons, neutrons, and electrons. Solid is the state in which intermolecular attractions keep the molecules in fixed spatial relationships. Liquid is the state in which intermolecular</p> |

| | |
|------------------------------------|---|
| | <p>attractions keep molecules in proximity, but not in fixed relationships. Gas is the state in which molecules are comparatively separated and intermolecular attractions have relatively little effect on their respective motions.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.8.P.8.2:</p> | <p>Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.</p> |
| <p>SC.8.P.8.3:</p> | <p>Explore and describe the densities of various materials through measurement of their masses and volumes.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.</p> |
| <p>SC.8.P.8.4:</p> | <p>Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.</p> |
| <p>SC.8.P.8.5:</p> | <p>Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.</p> <p>Remarks/Examples: Demonstrate with atomic models how atoms can combine in many ways. Explain why there are many, but limited, combinations. Use models to demonstrate the conservation of mass in modeled chemical reactions.</p> |
| <p>SC.8.P.8.6:</p> | <p>Recognize that elements are grouped in the periodic table according to similarities of their properties.</p> |
| <p>SC.8.P.8.7:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).</p> |

| | |
|-------------------------------|---|
| | <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.8.P.8.9: | <p>Distinguish among mixtures (including solutions) and pure substances.</p> <p>Remarks/Examples: Pure substances include elements and compounds. Mixtures are classified as heterogeneous (mixtures) or homogeneous (solutions). Methods for separating mixtures include: distillation, chromatography, reverse osmosis, diffusion through semi-permeable membranes.</p> |
| SC.8.P.8.8: | Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts. |
| SC.8.P.9.2: | Differentiate between physical changes and chemical changes. |
| SC.8.P.9.3: | Investigate and describe how temperature influences chemical changes. |
| SC.8.P.9.1: | Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes. |
| SC.912.P.8.1: | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| SC.912.P.8.2: | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| SC.912.P.8.4: | Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the |

atom.

Remarks/Examples:

Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.912.P.8.5:](#)

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

Remarks/Examples:

Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.

[SC.912.P.8.7:](#)

Interpret formula representations of molecules and compounds in terms of composition and structure.

Remarks/Examples:

Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.

[SC.912.P.8.11:](#)

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Remarks/Examples:

Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.

[SC.912.P.10.5:](#)

Relate temperature to the average molecular kinetic energy.

Remarks/Examples:

Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.

[SC.912.P.10.1:](#)

Differentiate among the various forms of energy and recognize

that they can be transformed from one form to others.

Remarks/Examples:

Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.

[SC.912.P.10.4:](#)

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

[MAFS.7.SP.2.4:](#)

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

[MAFS.7.SP.3.5:](#)

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

[MAFS.8.F.2.5:](#)

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

[MAFS.8.G.3.9:](#)

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Remarks/Examples:

Fluency Expectations or Examples of Culminating Standards

When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous

grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

[LAFS.8.SL.1.1:](#)

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
- c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
- d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

[LAFS.8.SL.1.2:](#)

Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

[LAFS.8.SL.1.3:](#)

Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

[LAFS.8.SL.2.4:](#)

Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

[LAFS.8.SL.2.5:](#)

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

[LAFS.68.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts.

[LAFS.68.RST.1.2:](#)

Determine the central ideas or conclusions of a text; provide an

| | |
|-----------------------------------|--|
| | accurate summary of the text distinct from prior knowledge or opinions. |
| LAFS.68.RST.1.3: | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| LAFS.68.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. |
| LAFS.68.RST.2.5: | Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. |
| LAFS.68.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. |
| LAFS.68.RST.3.7: | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |
| LAFS.68.RST.3.8: | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. |
| LAFS.68.RST.3.9: | Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. |
| LAFS.68.RST.4.10: | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. |
| LAFS.68.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented. |
| LAFS.68.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader |

| | |
|------------------------------------|--|
| | <p>categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</p> <ul style="list-style-type: none"> b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. |
| LAFS.68.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.68.WHST.2.5: | With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. |
| LAFS.68.WHST.2.6: | Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. |
| LAFS.68.WHST.3.7: | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LAFS.68.WHST.3.8: | Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. |
| LAFS.68.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.68.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

M/J Science Transfer (#2000220)

Version for Academic Year: 2015 - 2016

Course Number: 2000220

Abbreviated Title: M/J SCI TRAN

Course Length: Year (Y)

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 6,7,8

GENERAL NOTES

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

| Name | Description |
|-----------------------------------|--|
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Science Transfer (#2000990)

Version for Academic Year: 2015 - 2016

Course Number: 2000990

Abbreviated Title: SCI TRAN

Course Status: Draft - Course Pending Approval

GENERAL NOTES

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

| Name | Description |
|-----------------------------------|--|
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Experimental Science 1 Honors (#2002340)

Version for Academic Year: 2015 - 2016

Course Number: 2002340

Abbreviated Title: EXP SCI 1 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Elective

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record |

measurements at appropriate levels of precision. Follow safety guidelines).

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form

(e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to

its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.2:](#)

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

| | |
|---|---|
| | <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> |

- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.S-IC.2.3:](#)

Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

[LAFS.910.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating

| | |
|------------------------------------|---|
| | the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical |

texts in the grades 9–10 text complexity band independently and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.910.WHST.1.1:](#)

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.910.WHST.1.2:](#)

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the

| | |
|-------------------------------------|---|
| | <p>discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Experimental Science 2 Honors (#2002350)

Version for Academic Year: 2015 - 2016

Course Number: 2002350

Abbreviated Title: EXP SCI 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Elective

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.

5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine |

relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and

scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and,
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.2:](#)

Describe the role consensus plays in the historical development

| | |
|---|---|
| | <p>of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <p>a. Graph linear and quadratic functions and show intercepts,</p> |

- maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.S-IC.2.3:](#)

Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★

[MAFS.912.S-IC.2.6:](#)

Evaluate reports based on data. ★

[LAFS.910.SL.1.1:](#)

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse

| | |
|-----------------------------------|---|
| | media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |

[LAFS.910.RST.4.10:](#)

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.910.WHST.1.1:](#)

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.910.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone

| | |
|-------------------------------------|---|
| | <p>while attending to the norms and conventions of the discipline in which they are writing.</p> <p>f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Experimental Science 3 Honors (#2002360)

Version for Academic Year: 2015 - 2016

Course Number: 2002360

Abbreviated Title: EXP SCI 3 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Elective

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1 and 2. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.

5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.

- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples:</p> </div> |

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory

texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason

abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and

| | |
|--------------------------------------|---|
| | <p>expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific</p> |

| | |
|------------------------------------|---|
| | <p>method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.F-IF.3.7: | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| MAFS.912.S-IC.2.3: | Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★ |
| MAFS.912.S-IC.2.6: | Evaluate reports based on data. ★ |
| LAFS.1112.SL.1.1: | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. |

| | |
|------------------------------------|--|
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | <p>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> |
| LAFS.1112.SL.1.3: | <p>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</p> |
| LAFS.1112.SL.2.4: | <p>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> |
| LAFS.1112.SL.2.5: | <p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p> |
| LAFS.1112.RST.1.1: | <p>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> |
| LAFS.1112.RST.1.2: | <p>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> |

| | |
|-------------------------------------|--|
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax |

to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

[LAFS.1112.WHST.1.2:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.1112.WHST.2.4:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose

[LAFS.1112.WHST.2.5:](#)

| | |
|--------------------------------------|---|
| | and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Experimental Science 4 Honors (#2002370)

Version for Academic Year: 2015 - 2016

Course Number: 2002370

Abbreviated Title: EXP SCI 4 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Elective

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1, 2 and 3. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.

5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.

- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|--------------------------------------|---|
| <p>SC.912.N.1.1:</p> | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections for 6-12 Literacy in</p> </div> |

Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific

procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct

viaable arguments and critique the reasoning of others

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.2.4:](#)

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.2.5:](#)

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and

| | |
|--------------------------------------|---|
| | <p>quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A</p> |

| | |
|---|--|
| | <p>number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift. |
| <p>MAFS.912.S-IC.2.3:</p> | <p>Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★</p> |
| <p>MAFS.912.S-IC.2.6:</p> | <p>Evaluate reports based on data. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and |

| | |
|------------------------------------|---|
| | <p>researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</p> <ul style="list-style-type: none"> b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| LAFS.1112.SL.1.2: | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| LAFS.1112.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical |

| | |
|-------------------------------------|--|
| | tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| | Write arguments focused on <i>discipline-specific content</i> . |
| LAFS.1112.WHST.1.1: | <ol style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and |

| | |
|--|---|
| | <p>reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <ul style="list-style-type: none"> d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. |
| <p>LAFS.1112.WHST.1.2:</p> | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). |
| <p>LAFS.1112.WHST.2.4:</p> | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| <p>LAFS.1112.WHST.2.5:</p> | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| <p>LAFS.1112.WHST.2.6:</p> | <p>Use technology, including the Internet, to produce, publish, and</p> |

| | |
|--------------------------------------|---|
| | update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

M/J Comprehensive Science 1 Accelerated Honors (#2002055)

Version for Academic Year: 2015 - 2016

Course Number: 2002055

Abbreviated Title: M/J COMPSCI1 ACC HON

Course Length: Year (Y)

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 6,7,8

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English

language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|---|--|
| <p>SC.6.N.1.2:</p> <p>SC.6.N.1.1:</p> | <p>Explain why scientific investigations should be replicable.</p> <p>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> </div> |
| <p>SC.6.N.1.3:</p> | <p>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</p> |

| | |
|-----------------------------|---|
| | <p>Remarks/Examples: Explain that an investigation is observing or studying the natural world, without interference or manipulation, and an experiment is an investigation that involves variables (independent/manipulated and dependent/ outcome) and establishes cause-and-effect relationships (Schwartz, 2007).</p> |
| SC.6.N.1.4: | Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation. |
| SC.6.N.1.5: | <p>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</p> <p>Remarks/Examples: Florida Standards Connections: LAFS.68.RST.3.7 LAFS.68.WHST.1.2 and, LAFS.68.WHST.3.9.</p> |
| SC.6.N.2.1: | <p>Distinguish science from other activities involving thought.</p> <p>Remarks/Examples: Thought refers to any mental or intellectual activity involving an individual's subjective consciousness. Science is a systematic process that pursues, builds and organizes knowledge in the form of testable explanations and predictions about the natural world.</p> |
| SC.6.N.2.2: | Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered. |
| SC.6.N.2.3: | Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals. |
| SC.6.N.3.3: | Give several examples of scientific laws. |
| SC.6.N.3.4: | <p>Identify the role of models in the context of the sixth grade science benchmarks.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.6.N.3.1: | Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life. |
| SC.6.N.3.2: | Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. |

| | |
|-----------------------------|---|
| | Thus, scientific laws are different from societal laws. |
| SC.6.E.6.1: | Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition. |
| SC.6.E.6.2: | Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida. Remarks/Examples: Annually assessed on Grade 5 Science FCAT 2.0. Also assesses SC.4.E.6.1 . |
| SC.6.E.7.1: | Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system. |
| SC.6.E.7.2: | Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.6.E.7.3: | Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically MAFS.K12.MP.6: Attend to precision and, MAFS.K12.MP.7: Look for and make use of structure. |
| SC.6.E.7.4: | Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere. |
| SC.6.E.7.5: | Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.6.E.7.6: | Differentiate between weather and climate. |

| | |
|------------------------------|--|
| SC.6.E.7.7: | Investigate how natural disasters have affected human life in Florida. |
| SC.6.E.7.8: | Describe ways human beings protect themselves from hazardous weather and sun exposure. |
| | Describe how the composition and structure of the atmosphere protects life and insulates the planet. |
| SC.6.E.7.9: | <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| SC.6.P.11.1: | Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa. |
| | Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship. |
| SC.6.P.12.1: | <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.</p> |
| SC.6.P.13.1: | Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational. |
| SC.6.P.13.2: | Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are. |
| SC.6.P.13.3: | Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both. |
| | Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms. |
| SC.6.L.14.1: | <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| SC.6.L.14.2: | Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life. |
| SC.6.L.14.3: | Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy |

| | |
|------------------------------|--|
| | from food, getting rid of waste, and reproducing. |
| SC.6.L.14.4: | <p>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> </div> |
| SC.6.L.14.5: | Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis. |
| SC.6.L.14.6: | <p>Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Integrate HE.6.C.1.8. Explain how body systems are impacted by hereditary factors and infectious agents.</p> </div> |
| SC.6.L.15.1: | Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains. |
| SC.8.N.1.2: | Design and conduct a study using repeated trials and replication. |
| SC.8.N.1.3: | Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim. |
| SC.8.N.1.4: | Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data. |
| SC.8.N.1.5: | Analyze the methods used to develop a scientific explanation as seen in different fields of science. |
| SC.8.N.1.6: | <p>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> </div> |
| SC.8.P.8.1: | Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in |

solids, liquids, and gases.

Remarks/Examples:

Recognize that matter is composed of discrete units called atoms and atoms are composed of sub-atomic particles called protons, neutrons, and electrons. Solid is the state in which intermolecular attractions keep the molecules in fixed spatial relationships. Liquid is the state in which intermolecular attractions keep molecules in proximity, but not in fixed relationships. Gas is the state in which molecules are comparatively separated and intermolecular attractions have relatively little effect on their respective motions.

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

[SC.8.P.8.2:](#)

Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

Explore and describe the densities of various materials through measurement of their masses and volumes.

[SC.8.P.8.3:](#)

Remarks/Examples:

Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.

[SC.8.P.8.4:](#)

Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

Remarks/Examples:

Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.

[SC.8.P.8.5:](#)

Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

Remarks/Examples:

Demonstrate with atomic models how atoms can combine in many ways. Explain why there are many, but limited, combinations. Use models to demonstrate the conservation of

| | |
|-------------------------------|---|
| | mass in modeled chemical reactions. |
| SC.8.P.8.6: | Recognize that elements are grouped in the periodic table according to similarities of their properties. |
| SC.8.P.8.7: | Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons). Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.8.P.8.9: | Distinguish among mixtures (including solutions) and pure substances. Remarks/Examples: Pure substances include elements and compounds. Mixtures are classified as heterogeneous (mixtures) or homogeneous (solutions). Methods for separating mixtures include: distillation, chromatography, reverse osmosis, diffusion through semi-permeable membranes. |
| SC.8.P.8.8: | Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts. |
| SC.912.E.5.4: | Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth. Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth. |
| SC.912.E.7.3: | Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes. |
| SC.912.E.7.5: | Predict future weather conditions based on present observations |

| | |
|--------------------------------|---|
| | <p>and conceptual models and recognize limitations and uncertainties of such predictions.</p> <p>Remarks/Examples: Use models, weather maps and other tools to predict weather conditions and differentiate between accuracy of short-range and long-range weather forecasts.</p> |
| SC.912.E.7.6: | <p>Relate the formation of severe weather to the various physical factors.</p> <p>Remarks/Examples: Identify the causes of severe weather. Compare and contrast physical factors that affect the formation of severe weather events (e.g. hurricanes, tornados, flash floods, thunderstorms, and drought).</p> |
| SC.912.P.8.1: | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| SC.912.P.8.2: | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| SC.912.P.8.7: | <p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p> |
| SC.912.P.10.4: | <p>Describe heat as the energy transferred by convection, conduction,</p> |

| | |
|---------------------------------|---|
| | and radiation, and explain the connection of heat to change in temperature or states of matter. |
| SC.912.L.14.2: | Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport). |
| SC.912.L.14.3: | Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells. |
| | <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.14.2.</p> |
| SC.912.L.16.14: | Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. |
| MAFS.7.SP.2.4: | Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i> |
| MAFS.7.SP.3.5: | Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. |
| MAFS.8.SP.1.4: | Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. <i>For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</i> |
| LAFS.7.SL.1.1: | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. |
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation |

| | |
|----------------------------------|---|
| | <p>by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.</p> <p>b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.</p> <p>c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.</p> <p>d. Acknowledge new information expressed by others and, when warranted, modify their own views.</p> |
| LAFS.7.SL.1.2: | Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. |
| LAFS.7.SL.1.3: | Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence. |
| LAFS.7.SL.2.4: | Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. |
| LAFS.7.SL.2.5: | Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. |
| LAFS.68.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts. |
| LAFS.68.RST.1.2: | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. |
| LAFS.68.RST.1.3: | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| LAFS.68.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. |
| LAFS.68.RST.2.5: | Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. |
| LAFS.68.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. |
| LAFS.68.RST.3.7: | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |
| LAFS.68.RST.3.8: | Distinguish among facts, reasoned judgment based on research |

| | |
|-----------------------------------|---|
| | findings, and speculation in a text. |
| LAFS.68.RST.3.9: | Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. |
| LAFS.68.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. Establish and maintain a formal style. Provide a concluding statement or section that follows from and supports the argument presented. |
| LAFS.68.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. Use precise language and domain-specific vocabulary to inform about or explain the topic. Establish and maintain a formal style and objective tone. Provide a concluding statement or section that follows from and supports the information or explanation presented. |
| LAFS.68.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.68.WHST.2.5: | With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, |

| | |
|------------------------------------|---|
| | rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. |
| LAFS.68.WHST.2.6: | Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. |
| LAFS.68.WHST.3.7: | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LAFS.68.WHST.3.8: | Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. |
| LAFS.68.WHST.3.9: | Draw evidence from informational texts to support analysis reflection, and research. |
| LAFS.68.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| HE.7.C.1.3: | Analyze how environmental factors affect personal health. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>Remarks/Examples: Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.</p> </div> |
| HE.7.C.1.7: | Describe how heredity can affect personal health. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>Remarks/Examples: Sickle-cell anemia, diabetes, and acne.</p> </div> |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

M/J Comprehensive Science 2 Accelerated Honors (#2002085)

Version for Academic Year: 2015 - 2016

Course Number: 2002085

Abbreviated Title: M/J COMPSCI2 ACC HON

Course Length: Year (Y)

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 6,7,8

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts

for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-----------------------------|--|
| SC.7.N.1.2: | Differentiate replication (by others) from repetition (multiple trials). |
| SC.7.N.1.1: | <p>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Florida Standards Connections: LAFS.68.RST.1.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical</p> </div> |

| | |
|-----------------------------|---|
| | tasks. |
| SC.7.N.1.3: | Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation. |
| SC.7.N.1.4: | Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment. |
| SC.7.N.1.5: | Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics. |
| SC.7.N.1.6: | Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based. |
| SC.7.N.1.7: | Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community. |
| SC.7.N.2.1: | Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered. |
| SC.7.N.3.2: | Identify the benefits and limitations of the use of scientific models. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.7.N.3.1: | Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them. |
| SC.7.E.6.1: | Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores. |
| SC.7.E.6.2: | Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building). Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure. |
| SC.7.E.6.3: | Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating. |
| SC.7.E.6.4: | Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes. |

| | |
|------------------------------|--|
| SC.7.E.6.5: | Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building. |
| SC.7.E.6.6: | Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water. |
| SC.7.E.6.7: | Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins. |
| SC.7.P.10.2: | Observe and explain that light can be reflected, refracted, and/or absorbed. |
| SC.7.P.10.1: | Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. |
| SC.7.P.10.3: | Recognize that light waves, sound waves, and other waves move at different speeds in different materials. |
| SC.7.P.11.2: | Investigate and describe the transformation of energy from one form to another. |
| SC.7.P.11.1: | Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state. |
| SC.7.P.11.3: | Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another. |
| SC.7.P.11.4: | Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature. |
| SC.7.L.15.1: | Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species. |
| SC.7.L.15.2: | Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms. |
| SC.7.L.15.3: | Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species. |
| SC.7.L.16.1: | Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another. |
| | Remarks/Examples: |

| | |
|------------------------------|---|
| | Integrate HE.7.C.1.4 . Describe how heredity can affect personal health. |
| SC.7.L.16.2: | Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees. |
| SC.7.L.16.3: | Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis. |
| | Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment. |
| SC.7.L.16.4: | <p>Remarks/Examples: Integrate HE.7.C.1.4. Describe how heredity can affect personal health.</p> |
| SC.7.L.17.1: | Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web. |
| SC.7.L.17.2: | Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism. |
| SC.7.L.17.3: | Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites. |
| SC.8.N.1.1: | Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. |
| | Distinguish between scientific and pseudoscientific ideas. |
| SC.8.N.2.1: | <p>Remarks/Examples: Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations (e.g. astrology is pseudoscience).</p> |
| | Discuss what characterizes science and its methods. |
| SC.8.N.2.2: | <p>Remarks/Examples: Science is the systematic, organized inquiry that is derived from observations and experimentation that can be verified</p> |

| | |
|-----------------------------|--|
| | through testing to explain natural phenomena. |
| SC.8.N.3.1: | Select models useful in relating the results of their own investigations. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics. |
| SC.8.N.3.2: | Explain why theories may be modified but are rarely discarded. |
| SC.8.N.4.2: | Explain how political, social, and economic concerns can affect science, and vice versa. |
| SC.8.N.4.1: | Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels. |
| SC.8.E.5.1: | Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance. |
| SC.8.E.5.2: | Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars. |
| SC.8.E.5.3: | Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition. |
| SC.8.E.5.4: | Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions. |
| SC.8.E.5.5: | Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness). |
| SC.8.E.5.6: | Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics and MAFS.K12.MP.7: Look for and make use of structure. |
| SC.8.E.5.7: | Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions. |
| SC.8.E.5.8: | Compare various historical models of the Solar System, including geocentric and heliocentric. |

| | |
|------------------------------|---|
| | <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| SC.8.E.5.9: | <p>Explain the impact of objects in space on each other including:</p> <ol style="list-style-type: none"> 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body. |
| SC.8.E.5.10: | <p>Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically; and, MAFS.K12.MP.6: Attend to precision.</p> |
| SC.8.E.5.11: | <p>Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.</p> |
| SC.8.E.5.12: | <p>Summarize the effects of space exploration on the economy and culture of Florida.</p> |
| SC.8.P.9.2: | <p>Differentiate between physical changes and chemical changes.</p> |
| SC.8.P.9.3: | <p>Investigate and describe how temperature influences chemical changes.</p> |
| SC.8.P.9.1: | <p>Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.</p> |
| SC.8.L.18.1: | <p>Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.</p> |
| SC.8.L.18.2: | <p>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</p> |
| SC.8.L.18.3: | <p>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</p> <p>Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: Model</p> |

| | |
|-------------------------------|--|
| | with mathematics. |
| SC.8.L.18.4: | Cite evidence that living systems follow the Laws of Conservation of Mass and Energy. |
| | Describe and differentiate the layers of Earth and the interactions among them. |
| SC.912.E.6.1: | <p>Remarks/Examples: Recognize the importance of the study of seismic wave data and how it can be used to determine the internal structure, density variations, and dynamic processes between Earth's layers.</p> |
| | Connect surface features to surface processes that are responsible for their formation. |
| SC.912.E.6.2: | <p>Remarks/Examples: Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.</p> |
| | Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates. |
| SC.912.E.6.3: | <p>Remarks/Examples: Discuss the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. Compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). Explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).</p> |
| SC.912.P.8.4: | Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom. |
| | <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the</p> |

| | |
|---------------------------------------|---|
| | <p>atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.5:</p> | <p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.P.10.5:</p> | <p>Relate temperature to the average molecular kinetic energy.</p> <p>Remarks/Examples: Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.</p> |
| <p>SC.912.P.10.1:</p> | <p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p>Remarks/Examples: Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound</p> |

| | |
|---------------------------------|--|
| | energy when the object hits the ground. |
| SC.912.L.15.6: | <p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| SC.912.L.15.13: | <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> |
| SC.912.L.16.2: | Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles. |
| SC.912.L.16.16: | Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores. |
| SC.912.L.17.6: | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| SC.912.L.17.9: | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> |
| SC.912.L.18.7: | Identify the reactants, products, and basic functions of photosynthesis. |
| SC.912.L.18.8: | Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. |
| SC.912.L.18.9: | <p>Explain the interrelated nature of photosynthesis and cellular respiration.</p> <p>Remarks/Examples:</p> |

Annually assessed on Biology EOC. Also assesses [SC.912.L.18.7](#) [SC.912.L.18.8](#) [SC.912.L.18.10](#).

[HE.7.C.1.4:](#)

Describe how heredity can affect personal health.

Remarks/Examples:

Some examples may include sickle cell anemia, diabetes, acne.

[MAFS.8.F.2.5:](#)

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

[MAFS.8.G.3.9:](#)

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Remarks/Examples:

Fluency Expectations or Examples of Culminating Standards

When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

[MAFS.8.SP.1.4:](#)

Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

[LAFS.8.SL.1.1:](#)

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

| | |
|----------------------------------|---|
| | <ul style="list-style-type: none"> a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented. |
| LAFS.8.SL.1.2: | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| LAFS.8.SL.1.3: | Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced. |
| LAFS.8.SL.2.4: | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. |
| LAFS.8.SL.2.5: | Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. |
| LAFS.68.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts. |
| LAFS.68.RST.1.2: | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. |
| LAFS.68.RST.1.3: | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| LAFS.68.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. |
| LAFS.68.RST.2.5: | Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. |
| LAFS.68.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. |

| | |
|-----------------------------------|--|
| LAFS.68.RST.3.7: | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |
| LAFS.68.RST.3.8: | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. |
| LAFS.68.RST.3.9: | Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. |
| LAFS.68.RST.4.10: | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. |
| LAFS.68.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented. |
| LAFS.68.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation |

| | |
|------------------------------------|---|
| | presented. |
| LAFS.68.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.68.WHST.2.5: | With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. |
| LAFS.68.WHST.2.6: | Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. |
| LAFS.68.WHST.3.7: | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LAFS.68.WHST.3.8: | Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. |
| LAFS.68.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.68.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Biology 1 for Credit Recovery (#2000315)

Version for Academic Year: 2015 - 2016

Course Number: 2000315

Abbreviated Title: BIO 1 CR

Number of Credits: One credit (1)

Course Length: Credit Recovery (R)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Biology 1 for Credit Recovery

Special Notes: Credit Recovery courses are credit bearing courses with specific content requirements defined by Next Generation Sunshine State Standards and/or Florida Standards. Students enrolled in a Credit Recovery course must have previously attempted the corresponding course (and/or End-of-Course assessment) since the course requirements for the Credit Recovery course are exactly the same as the previously attempted corresponding course. For example, Geometry (1206310) and Geometry for Credit Recovery (1206315) have identical content requirements. It is important to note that Credit Recovery courses are not bound by [Section 1003.436\(1\)\(a\), Florida Statutes](#), requiring a minimum of 135 hours of bona fide instruction (120 hours in a school/district implementing block scheduling) in a designed course of study that contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should **ONLY** be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |

3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed

visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

[SC.912.N.1.3:](#)

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

[SC.912.N.1.4:](#)

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

[SC.912.N.2.1:](#)

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

[SC.912.N.2.2:](#)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.1:](#)

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories

| | |
|--|--|
| | <p>explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.L.14.4:</p> | <p>Compare and contrast structure and function of various types of microscopes.</p> |
| <p>SC.912.L.14.1:</p> | <p>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</p> <p>Remarks/Examples: Describe how continuous investigations and/or new scientific information influenced the development of the cell theory. Recognize the contributions of scientists in the development of the cell theory.</p> |
| <p>SC.912.L.14.2:</p> | <p>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</p> |
| <p>SC.912.L.14.3:</p> | <p>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.14.2.</p> |
| <p>SC.912.L.14.6:</p> | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| <p>SC.912.L.14.7:</p> | <p>Relate the structure of each of the major plant organs and tissues to physiological processes.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC.</p> |
| <p>SC.912.L.14.26:</p> | <p>Identify the major parts of the brain on diagrams or models.</p> |

| | |
|--|---|
| | <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.L.14.36:</p> | <p>Describe the factors affecting blood flow through the cardiovascular system.</p> |
| <p>SC.912.L.14.52:</p> | <p>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.14.6 HE.912.C.1.7 and HE.912.C.1.5.</p> |
| <p>SC.912.L.15.1:</p> | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| <p>SC.912.L.15.4:</p> | <p>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</p> |
| <p>SC.912.L.15.5:</p> | <p>Explain the reasons for changes in how organisms are classified.</p> |
| <p>SC.912.L.15.6:</p> | <p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <p>Remarks/Examples:</p> <p>Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| <p>SC.912.L.15.8:</p> | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| <p>SC.912.L.15.10:</p> | <p>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size,</p> |

| | |
|--|---|
| <p>SC.912.L.15.13:</p> | <p>jaw size, language, and manufacture of tools.</p> <p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.</p> </div> |
| <p>SC.912.L.15.14:</p> | <p>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</p> |
| <p>SC.912.L.15.15:</p> | <p>Describe how mutation and genetic recombination increase genetic variation.</p> |
| <p>SC.912.L.16.1:</p> | <p>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.16.2.</p> </div> |
| <p>SC.912.L.16.2:</p> | <p>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</p> |
| <p>SC.912.L.16.9:</p> | <p>Explain how and why the genetic code is universal and is common to almost all organisms.</p> |
| <p>SC.912.L.16.3:</p> | <p>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health. Annually assessed on Biology EOC. Also assesses SC.912.L.16.4 SC.912.L.16.5 SC.912.L.16.9.</p> </div> |
| <p>SC.912.L.16.4:</p> | <p>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</p> |
| <p>SC.912.L.16.5:</p> | <p>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</p> |
| <p>SC.912.L.16.8:</p> | <p>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> </div> |

| | |
|---------------------------------|---|
| | Integrate HE.912.C.1.7 . Analyze how heredity and family history can impact personal health. |
| SC.912.L.16.10: | <p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.16.13: | <p>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> |
| SC.912.L.16.14: | Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. |
| SC.912.L.16.16: | Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores. |
| SC.912.L.16.17: | <p>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.8 SC.912.L.16.14 SC.912.L.16.16.</p> |
| SC.912.L.17.2: | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| SC.912.L.17.4: | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| SC.912.L.17.5: | <p>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses</p> |

| | |
|---------------------------------|---|
| | SC.912.L.17.2 SC.912.L.17.4 SC.912.L.17.8 SC.912.N.1.4 . |
| SC.912.L.17.8: | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| SC.912.L.17.9: | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1 . |
| SC.912.L.17.11: | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| SC.912.L.17.13: | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| SC.912.L.17.20: | Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.17.11 , SC.912.L.17.13 , SC.912.N.1.3 . |
| SC.912.L.18.1: | Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11 . |
| SC.912.L.18.7: | Identify the reactants, products, and basic functions of photosynthesis. |
| SC.912.L.18.8: | Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. |
| SC.912.L.18.9: | Explain the interrelated nature of photosynthesis and cellular respiration. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10 . |

| | |
|-----------------------------------|---|
| SC.912.L.18.10: | Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| SC.912.L.18.12: | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| LAFS.910.SL.1.1: | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. |
| LAFS.910.SL.1.1c: | Propel conversations by posing and responding to questions that |

| | |
|-----------------------------------|---|
| | relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. |
| LAFS.910.SL.1.2: | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. |
| LAFS.910.SL.1.3: | Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. |
| LAFS.910.SL.2.4: | Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. |

[LAFS.910.RST.3.9:](#)

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

[LAFS.910.RST.4.10:](#)

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

[LAFS.910.WHST.1.1:](#)

Write arguments focused on *discipline-specific content*.

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.910.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to

manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

- e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

[LAFS.910.WHST.2.4:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.910.WHST.2.5:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

[LAFS.910.WHST.2.6:](#)

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

[LAFS.910.WHST.3.7:](#)

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

[LAFS.910.WHST.3.8:](#)

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

[LAFS.910.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

[LAFS.910.WHST.4.10:](#)

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

[HE.912.C.1.3:](#)

Evaluate how environment and personal health are interrelated.

Remarks/Examples:

Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-

| | |
|-----------------------------------|--|
| | <p>safety awareness; and weather, air, and water conditions.</p> |
| HE.912.C.1.5: | <p>Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> <p>Remarks/Examples: Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.</p> |
| HE.912.C.1.7: | <p>Analyze how heredity and family history can impact personal health.</p> <p>Remarks/Examples: Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.</p> |
| ELD.K12.ELL.1.1: | <p>English language learners communicate for social and instructional purposes within the school setting.</p> |
| ELD.K12.ELL.XX.1: | <p>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</p> |

Bioscience 1 Honors (#2000500)

Version for Academic Year: 2015 - 2016

Course Number: 2000500

Abbreviated Title: BIOSCIENCE 1 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3).

Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007). Bioscience I is a laboratory based course that focuses on introducing students to the basic lab techniques, equipment, critical thinking, work ethics, and communication skills currently used in the medical, agricultural, marine and industrial bioscience fields. Students will gain an understanding of basic DNA and molecular biology, epigenetics, genetically modified foods, bacterial plasmids, and forensics. Students will learn the principles, methodologies, and applications of equipment such as thermocyclers, horizontal gel electrophoresis apparatus, micropipettes, spectrophotometers, centrifuges, etc. Students will gain proficiency in calculating, preparing, and pH control of common lab reagents, solutions, buffers, and agarose gels. Students will learn the principles of qualitative and quantitative analysis using biomolecular indicators, spectrophotometry, and standard curves. Topics covered will include the genetics of cancer, epigenetics, emerging and re-emerging infectious diseases that affect plants and animals, ethics of bioscience, and careers in bioscience.

Laboratory activities should include but not be limited to:

- Sterilization, handling and safety requirements according to standard operating procedures;
- The preparation of buffer solutions and agarose gels for horizontal electrophoresis;
- The preparation of solutions for spectroscopy;
- Use a spectrophotometer to measure solution concentrations and graph standard curves;
- Bacterial transformation and ligation using the Green fluorescent protein gene;
- Extraction of DNA;
- Quantitative analysis of DNA molecular weights;
- Polymerase chain reactions using given primers;
- Simulate DNA fingerprinting techniques used in crime scene analysis using given gene sequences.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Biology

Corequisite: Honors Chemistry

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

*Modeling Standards: Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data. Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if |

- not, modify or develop new models).
5. **Plan investigations**, (Design and evaluate a scientific investigation).
 6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)**, (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
 7. **Pose answers, explanations, or descriptions of events**,
 8. **Generate explanations that explicate or describe natural phenomena (inferences)**,
 9. **Use appropriate evidence and reasoning to justify these explanations to others**,
 10. **Communicate results of scientific investigations**, and
 11. **Evaluate the merits of the explanations produced by others**.

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable

| | |
|--------------------------------------|--|
| | <p>questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.1.3:</p> | <p>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</p> <p>Remarks/Examples: Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.</p> <p>Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others</p> |
| <p>SC.912.N.1.4:</p> | <p>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</p> <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> |

| | |
|--------------------------------------|--|
| | <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many</p> |

scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.2:](#)

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Remarks/Examples:

Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.3.3:](#)

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Remarks/Examples:

Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.

[SC.912.N.3.4:](#)

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Remarks/Examples:

Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.

[SC.912.N.3.5:](#)

Describe the function of models in science, and identify the wide range of models used in science.

| | |
|---------------------------------------|---|
| | <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.P.8.12:</p> | <p>Describe the properties of the carbon atom that make the</p> |

diversity of carbon compounds possible.

Remarks/Examples:

Explain how the bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.

[SC.912.P.8.13:](#)

Identify selected functional groups and relate how they contribute to properties of carbon compounds.

Remarks/Examples:

Recognize functional groups in structural formulas of carbon molecules (e.g. sugars, proteins, nucleotides, amino acids, hydroxyl groups which form alcohols, carbonyl groups which form aldehydes / ketones, carboxyl groups which form carboxylic acids, etc.).

[SC.912.L.14.1:](#)

Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.

Remarks/Examples:

Describe how continuous investigations and/or new scientific information influenced the development of the cell theory. Recognize the contributions of scientists in the development of the cell theory.

[SC.912.L.14.2:](#)

Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).

[SC.912.L.14.3:](#)

Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Remarks/Examples:

Annually Assessed on Biology EOC. Also assesses [SC.912.L.14.2](#).

[SC.912.L.14.6:](#)

Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.

[SC.912.L.15.15:](#)

Describe how mutation and genetic recombination increase genetic variation.

[SC.912.L.16.2:](#)

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

| | |
|---------------------------------|---|
| SC.912.L.16.9: | Explain how and why the genetic code is universal and is common to almost all organisms. |
| | Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information. |
| SC.912.L.16.3: | <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health. Annually assessed on Biology EOC. Also assesses SC.912.L.16.4 SC.912.L.16.5 SC.912.L.16.9.</p> |
| SC.912.L.16.4: | Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. |
| SC.912.L.16.5: | Explain the basic processes of transcription and translation, and how they result in the expression of genes. |
| SC.912.L.16.6: | Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level. |
| SC.912.L.16.7: | Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology. |
| | Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer. |
| SC.912.L.16.8: | <p>Remarks/Examples:</p> <p>Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health.</p> |
| | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. |
| SC.912.L.16.10: | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC.</p> |
| SC.912.L.16.12: | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| | Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. |
| SC.912.L.18.1: | <p>Remarks/Examples:</p> <p>Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.</p> |
| SC.912.L.18.2: | Describe the important structural characteristics of |

| | |
|--------------------------------|--|
| | <p>monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</p> |
| SC.912.L.18.3: | <p>Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.</p> |
| | <p>Propose strategies to reduce or prevent injuries and health problems.</p> |
| HE.912.C.1.5: | <p>Remarks/Examples: Some examples may include mandatory passenger restraint/helmet laws, mandatory immunizations, improve inspection of food sources.</p> |
| | <p>Assess the degree of susceptibility to injury, illness or death if engaging in unhealthy/risky behaviors.</p> |
| HE.912.C.1.7: | <p>Remarks/Examples: Some examples may include death from alcohol poisoning, cancer and chronic lung disease related to tobacco use, overdose from illegal drug use, date rape as a result of alcohol use and/or adulterated food or beverage, child abuse or neglect, and serial monogamy.</p> |
| | <p>Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</p> |
| HE.912.C.1.8: | <p>Remarks/Examples: Some examples may include health prevention, detection, and treatment: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.</p> |
| SS.912.C.2.4: | <p>Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good.</p> |
| | <p>Analyze the impact of citizen participation as a means of achieving political and social change.</p> |
| SS.912.C.2.8: | <p>Remarks/Examples: Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.</p> |
| SS.912.C.2.13: | <p>Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal.</p> |
| | <p>Remarks/Examples:</p> |

| | |
|--|--|
| | <p>Examples are political cartoons, propaganda, campaign advertisements, political speeches, electronic bumper stickers, blogs, media.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.2:</p> | <p>Define appropriate quantities for the purpose of descriptive modeling. ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples:</p> <p>Algebra 1 Content Notes:</p> <p>Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.</p> </div> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.A-CED.1.4:</p> | <p>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i> ★</p> |
| <p>MAFS.912.F-IF.2.4:</p> | <p>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★</p> |
| <p>MAFS.912.F-IF.3.7:</p> | <p>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</p> <ol style="list-style-type: none"> a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, |

| | |
|---|---|
| | <p>and showing end behavior.</p> <p>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.</p> |
| <p>MAFS.912.F-LE.1.1:</p> | <p>Distinguish between situations that can be modeled with linear functions and with exponential functions. ★</p> <p>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p> <p>c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</p> |
| <p>MAFS.912.S-ID.1.1:</p> | <p>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.1.3:</p> | <p>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</p> </div> |
| <p>MAFS.912.S-ID.2.6:</p> | <p>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</p> <p>a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</i></p> |

- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.910.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

[LAFS.910.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

[LAFS.910.SL.2.4:](#)

Present information, findings, and supporting evidence clearly,

| | |
|------------------------------------|---|
| | concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. |
| LAFS.910.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.910.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. |
| LAFS.910.RST.1.2: | Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. |
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | Write arguments focused on <i>discipline-specific content</i> . <ul style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization |

that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.910.WHST.1.2:](#)

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

| | |
|-------------------------------------|---|
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |

Bioscience 2 Honors (#2000510)

Version for Academic Year: 2015 - 2016

Course Number: 2000510

Abbreviated Title: BIOSCIENCE 2 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007). Bioscience II is a rigorous laboratory based course that provides an advanced foundation in the concepts, theories, and pioneering methods involved in micro and molecular based research including medical research, functional genomics, gene discovery, agriculture and forensics. Students will learn how to design plasmids and primers for polymerase chain reactions (PCR). Course focus will be on proteomics (the study of protein expression), protein separation and analysis, protein chromatography purification, protein quantification through spectroscopy, cladistical analysis, immunology, stem cell research, gene sequencing, and bioinformatics using BLAST (Basic Local Alignment Search Tool.) Emphasis will be placed on training students in the means by which to design experiments in preparation for independent research. Students will learn the principles, methodologies, and applications of equipment such as thermocyclers, horizontal and vertical gel electrophoresis, micropipettes, spectrophotometers, centrifuges, and other advanced laboratory apparatus used in the bioscience industry.

Laboratory activities may include but not be limited to:

- The preparation of buffer solutions and polyacrylamide gels for vertical electrophoresis;
- Quantitative analysis of protein molecular weights by developing a standard curve;
- Western blotting and ELISA testing;
- The preparation of serial dilutions for spectroscopy to determine unknown concentrations;
- Bacterial transformation and ligation using bacterial blue/white screening;
- Extraction of DNA for chromatography purification to be used for electrophoresis;
- Polymerase chain reactions using self designed primers;
- Gene Sequencing and Bioinformatics.

Special Notes

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Chemistry and Bioscience I/or AP Biology

Corequisite: Honors Physics

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none">1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).3. Examine books and other sources of information to see what is already known,4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).5. Plan investigations, (Design and evaluate a scientific investigation).6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).7. Pose answers, explanations, or descriptions of events, |

8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep

procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

Describe and explain what characterizes science and its methods.

[SC.912.N.1.2:](#)

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is

evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

[SC.912.N.1.5:](#)

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Remarks/Examples:

Recognize that contributions to science can be made and have been made by people from all over the world.

[SC.912.N.1.6:](#)

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

[SC.912.N.1.7:](#)

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

[SC.912.N.2.1:](#)

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

[SC.912.N.2.2:](#)

Remarks/Examples:

Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

[SC.912.N.2.3:](#)

Remarks/Examples:

Determine if the phenomenon (event) can be observed,

measured, and tested through scientific experimentation.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

[SC.912.N.2.4:](#)

Remarks/Examples:

Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

[SC.912.N.2.5:](#)

Remarks/Examples:

Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

[SC.912.N.3.1:](#)

Remarks/Examples:

Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.

| | |
|--------------------------------------|--|
| | <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.N.4.1:</p> | <p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision</p> |

| | |
|--|---|
| | <p>making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.4.2:</p> | <p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.P.8.11:</p> | <p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.</p> |
| <p>SC.912.L.14.6:</p> | <p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</p> |
| <p>SC.912.L.14.52:</p> | <p>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.14.6 HE.912.C.1.7 and HE.912.C.1.5.</p> |

| | |
|---------------------------------|--|
| SC.912.L.15.15: | Describe how mutation and genetic recombination increase genetic variation. |
| SC.912.L.16.9: | Explain how and why the genetic code is universal and is common to almost all organisms. |
| SC.912.L.16.4: | Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. |
| SC.912.L.16.5: | Explain the basic processes of transcription and translation, and how they result in the expression of genes. |
| SC.912.L.16.6: | Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level. |
| SC.912.L.16.7: | Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology. |
| SC.912.L.16.10: | Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. Remarks/Examples: Annually assessed on Biology EOC. |
| SC.912.L.16.12: | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| SC.912.L.18.4: | Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes. |
| HE.912.C.1.5: | Propose strategies to reduce or prevent injuries and health problems. Remarks/Examples: Some examples may include mandatory passenger restraint/helmet laws, mandatory immunizations, improve inspection of food sources. |
| HE.912.C.1.7: | Assess the degree of susceptibility to injury, illness or death if engaging in unhealthy/risky behaviors. Remarks/Examples: Some examples may include death from alcohol poisoning, cancer and chronic lung disease related to tobacco use, overdose from illegal drug use, date rape as a result of alcohol use and/or adulterated food or beverage, child |

| | |
|-------------------------------------|---|
| | abuse or neglect, and serial monogamy. |
| HE.912.C.1.8: | Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases. Remarks/Examples: Some examples may include health prevention, detection, and treatment: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease. |
| SS.912.C.2.4: | Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good. |
| SS.912.C.2.8: | Analyze the impact of citizen participation as a means of achieving political and social change. Remarks/Examples: Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors. |
| SS.912.C.2.13: | Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal. Remarks/Examples: Examples are political cartoons, propaganda, campaign advertisements, political speeches, electronic bumper stickers, blogs, media. |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.2: | Define appropriate quantities for the purpose of descriptive modeling. ★ Remarks/Examples: Algebra 1 Content Notes: Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions. |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.A-SSE.1.1: | Interpret expressions that represent a quantity in terms of its |

context. ★

- a. Interpret parts of an expression, such as terms, factors, and coefficients.
- b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P .*

[MAFS.912.A-CED.1.4:](#)

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R .* ★

[MAFS.912.F-IF.2.4:](#)

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★

[MAFS.912.F-IF.3.7:](#)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.F-LE.1.1:](#)

Distinguish between situations that can be modeled with linear functions and with exponential functions. ★

- a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions

- grow by equal factors over equal intervals.
- b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

[MAFS.912.S-ID.1.1:](#)

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.1.3:](#)

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Remarks/Examples:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

[MAFS.912.S-ID.2.6:](#)

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students

assess how well the model fits by analyzing residuals.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

[LAFS.1112.SL.1.1:](#)

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

[LAFS.1112.SL.1.2:](#)

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

[LAFS.1112.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

[LAFS.1112.SL.2.4:](#)

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

[LAFS.1112.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to

| | |
|-------------------------------------|---|
| | enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |
| LAFS.1112.RST.4.10: | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently. |
| LAFS.1112.WHST.1.1: | Write arguments focused on <i>discipline-specific content</i> . <ul style="list-style-type: none"> a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. |

- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

[LAFS.1112.WHST.1.2:](#)

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the

significance of the topic).

[LAFS.1112.WHST.2.4:](#)

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[LAFS.1112.WHST.2.5:](#)

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

[LAFS.1112.WHST.2.6:](#)

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

[LAFS.1112.WHST.3.7:](#)

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

[LAFS.1112.WHST.3.8:](#)

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

[LAFS.1112.WHST.3.9:](#)

Draw evidence from informational texts to support analysis, reflection, and research.

[LAFS.1112.WHST.4.10:](#)

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

[ELD.K12.ELL.1.1:](#)

English language learners communicate for social and instructional purposes within the school setting.

[ELD.K12.ELL.XX.1:](#)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Bioscience 3 Honors (#2000520)

Version for Academic Year: 2015 - 2016

Course Number: 2000520

Abbreviated Title: BIOSCIENCE 3 HON

Number of Credits: One credit (1)

Course Length: Year (Y)

Honors? Yes

Course Type: Core

Course Level: 3

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007). Bioscience III is an advanced laboratory based research course that will apply the conceptual knowledge and practical skills learned in Bioscience I and II. The goal of this course is to develop skills in the evaluation of research, to provide practice in scientific writing, to develop oral communication skills, and to expose students to current literature and research in the field of Bioscience. The first part of the course will focus on the analysis, evaluation, and discussion of recent Bioscience-related research publications. Students will be required to provide both oral and written evaluations of the publications that are discussed. Students will form teams and work with faculty to design and implement an independent research project, prepare a technical paper, and present their results. Students will be given the option to participate in local and/or national science competitions. Students will have opportunities to contact mentors from surrounding Bioscience educational and research facilities for advice during the development and implementation of their research projects.

Independent laboratory activities should emphasize experimental design of an original research project and may include but should not be limited to:

- Determine and implement specific electrophoresis techniques;
- Primer Design specified by the parameters of the research project;
- Plasmid Design;
- Extraction and purification of DNA and/or protein.

Special Notes

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

Ensuring wide reading from complex text that varies in length.

1. Making close reading and rereading of texts central to lessons.
2. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
3. Emphasizing students supporting answers based upon evidence from the text.
4. Providing extensive research and writing opportunities (claims and evidence).
5. Integration of Florida Standards for Mathematical Practice.

Pre-requisites: Bioscience II

Corequisite: Equally rigorous science course

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.

- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

MAFS.9-12.S.IC.1.5* and MAFS.912.S-ID.1.6*

*Modeling Standards: Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data. Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards.

| Name | Description |
|-------------------------------|--|
| SC.912.N.1.1: | <p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, |

microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or

inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2: Reason abstractly and quantitatively.

MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]

MAFS.K12.MP.4: Model with mathematics.

MAFS.K12.MP.5: Use appropriate tools strategically.

MAFS.K12.MP.6: Attend to precision.

MAFS.K12.MP.7: Look for and make use of structure.

MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3:
Construct viable arguments and critique the reasoning of

| | |
|--------------------------------------|---|
| | <p>others.</p> |
| <p>SC.912.N.1.3:</p> | <p>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</p> <p>Remarks/Examples: Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.</p> <p>Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others</p> |
| <p>SC.912.N.1.4:</p> | <p>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</p> <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p> |
| <p>SC.912.N.1.5:</p> | <p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p> |
| <p>SC.912.N.1.6:</p> | <p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.</p> |

| | |
|--------------------------------------|---|
| | <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p> |
| <p>SC.912.N.1.7:</p> | <p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p> |
| <p>SC.912.N.2.1:</p> | <p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p> |
| <p>SC.912.N.2.2:</p> | <p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |

| | |
|--------------------------------------|---|
| <p>SC.912.N.2.3:</p> | <p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p> </div> |
| <p>SC.912.N.2.4:</p> | <p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> </div> |
| <p>SC.912.N.2.5:</p> | <p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.</p> </div> |
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.2:</p> | <p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> |

Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

[SC.912.N.4.1:](#)

Remarks/Examples:

Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.

MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

[SC.912.N.4.2:](#)

Remarks/Examples:

Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

[SC.912.P.8.11:](#)

Remarks/Examples:

Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.

[SC.912.P.12.12:](#)

Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Remarks/Examples:

| | |
|---------------------------------|---|
| | <p>Various factors could include: temperature, pressure, solvent and/or solute concentration, sterics, surface area, and catalysts. The rate of reaction is determined by the activation energy, and the pathway of the reaction can be shorter in the presence of enzymes or catalysts. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric acid hydrogenation of a C=C double bond using nickel.</p> |
| SC.912.L.16.11: | Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis. |
| SC.912.L.18.11: | Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. |
| HE.912.C.1.3: | <p>Evaluate how environment and personal health are interrelated.</p> <p>Remarks/Examples: Some examples may include food options within a community, prenatal care services, availability of recreational facilities.</p> |
| HE.912.C.1.5: | <p>Propose strategies to reduce or prevent injuries and health problems.</p> <p>Remarks/Examples: Some examples may include mandatory passenger restraint/helmet laws, mandatory immunizations, improve inspection of food sources.</p> |
| HE.912.C.1.7: | <p>Assess the degree of susceptibility to injury, illness or death if engaging in unhealthy/risky behaviors.</p> <p>Remarks/Examples: Some examples may include death from alcohol poisoning, cancer and chronic lung disease related to tobacco use, overdose from illegal drug use, date rape as a result of alcohol use and/or adulterated food or beverage, child abuse or neglect, and serial monogamy.</p> |
| SS.912.C.2.4: | Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good. |
| SS.912.C.2.5: | Conduct a service project to further the public good. |

| | |
|--|--|
| | <p>Remarks/Examples: Examples are school, community, state, national, international.</p> |
| <p>SS.912.C.2.8:</p> | <p>Analyze the impact of citizen participation as a means of achieving political and social change.</p> <p>Remarks/Examples: Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.</p> |
| <p>SS.912.C.2.10:</p> | <p>Monitor current public issues in Florida.</p> <p>Remarks/Examples: Examples are On-line Sunshine, media, e-mails to government officials, political text messaging.</p> |
| <p>SS.912.C.2.13:</p> | <p>Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal.</p> <p>Remarks/Examples: Examples are political cartoons, propaganda, campaign advertisements, political speeches, electronic bumper stickers, blogs, media.</p> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.2:</p> | <p>Define appropriate quantities for the purpose of descriptive modeling. ★</p> <p>Remarks/Examples:</p> <p>Algebra 1 Content Notes:</p> <p>Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>MAFS.912.A-SSE.1.1:</p> | <p>Interpret expressions that represent a quantity in terms of its context. ★</p> <p>a. Interpret parts of an expression, such as terms, factors,</p> |

and coefficients.

- b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example,*

interpret $P(1+r)^n$ as the product of P and a factor not depending on P .

[MAFS.912.A-CED.1.4:](#)

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R .* ★

[MAFS.912.F-IF.3.7:](#)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

[MAFS.912.S-ID.2.6:](#)

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.*
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

Remarks/Examples:

| | |
|---|---|
| | <p>Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</p> |
| <p>MAFS.912.S-ID.3.8:</p> | <p>Compute (using technology) and interpret the correlation coefficient of a linear fit. ★</p> |
| <p>MAFS.912.S-IC.1.1:</p> | <p>Understand statistics as a process for making inferences about population parameters based on a random sample from that population. ★</p> |
| <p>MAFS.912.S-IC.2.5:</p> | <p>Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. ★</p> |
| <p>LAFS.1112.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. |
| <p>LAFS.1112.SL.1.2:</p> | <p>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> |

| | |
|------------------------------------|---|
| LAFS.1112.SL.1.3: | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| LAFS.1112.SL.2.4: | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| LAFS.1112.SL.2.5: | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LAFS.1112.RST.1.1: | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. |
| LAFS.1112.RST.1.2: | Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LAFS.1112.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| LAFS.1112.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| LAFS.1112.RST.2.5: | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| LAFS.1112.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |
| LAFS.1112.RST.3.7: | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LAFS.1112.RST.3.8: | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| LAFS.1112.RST.3.9: | Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting |

information when possible.

[LAFS.1112.RST.4.10:](#)

By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Write arguments focused on *discipline-specific content*.

[LAFS.1112.WHST.1.1:](#)

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

[LAFS.1112.WHST.1.2:](#)

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- c. Use varied transitions and sentence structures to link the

| | |
|--------------------------------------|---|
| | <p>major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</p> <p>d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> |
| LAFS.1112.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.1112.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.1112.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| LAFS.1112.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.1112.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| LAFS.1112.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.1112.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| ELD.K12.ELL.1.1: | English language learners communicate for social and instructional purposes within the school setting. |
| ELD.K12.ELL.XX.1: | English language learners communicate information, ideas and |

concepts necessary for academic success in the content area of Science.

Integrated Science 1 for Credit Recovery (#2002405)

Version for Academic Year: 2015 - 2016

Course Number: 2002405

Abbreviated Title: INTEG SCI 1 CR

Number of Credits: One credit (1)

Course Length: Credit Recovery (R)

Course Type: Core

Course Level: 2

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes: Credit Recovery courses are credit bearing courses with specific content requirements defined by Next Generation Sunshine State Standards and/or Florida Standards. Students enrolled in a Credit Recovery course must have previously attempted the corresponding course (and/or End-of-Course assessment) since the course requirements for the Credit Recovery course are exactly the same as the previously attempted corresponding course. For example, Geometry (1206310) and Geometry for Credit Recovery (1206315) have identical content requirements. It is important to note that Credit Recovery courses are not bound by Section 1003.436(1)(a), Florida Statutes, requiring a minimum of 135 hours of bona fide instruction (120 hours in a school/district implementing block scheduling) in a designed course of study that contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should **ONLY** be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

COURSE STANDARDS

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

| Name | Description |
|-------------------------------|---|
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for |

example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known,**
4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations,** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

Remarks/Examples:

Florida Standards Connections for 6-12 Literacy in Science

For Students in Grades 9-10

LAFS.910.RST.1.1 Cite specific textual evidence to support

analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

For Students in Grades 11-12

LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.

LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Florida Standards Connections for Mathematical Practices

MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
MAFS.K12.MP.2: Reason abstractly and quantitatively.
MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
MAFS.K12.MP.4: Model with mathematics.
MAFS.K12.MP.5: Use appropriate tools strategically.
MAFS.K12.MP.6: Attend to precision.
MAFS.K12.MP.7: Look for and make use of structure.
MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.

[SC.912.N.1.2:](#)

Describe and explain what characterizes science and its methods.

Remarks/Examples:

Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.

Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.

[SC.912.N.1.3:](#)

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Remarks/Examples:

Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others

[SC.912.N.1.4:](#)

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Remarks/Examples:

Read, interpret, and examine the credibility and validity of

scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.

Florida Standards Connections: [LAFS.910.RST.1.1](#) / [LAFS.1112.RST.1.1](#).

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

[SC.912.N.1.6:](#)

Remarks/Examples:

Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data.

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

[SC.912.N.1.7:](#)

Remarks/Examples:

Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).

Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

[SC.912.N.2.1:](#)

Remarks/Examples:

Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)

| | |
|--------------------------------------|---|
| <p>SC.912.N.3.1:</p> | <p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p> |
| <p>SC.912.N.3.3:</p> | <p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.</p> |
| <p>SC.912.N.3.4:</p> | <p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.</p> |
| <p>SC.912.N.3.5:</p> | <p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how models are used by scientists to explain observations of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.E.5.1:</p> | <p>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</p> |

| | |
|--------------------------------------|---|
| | <p>Remarks/Examples: Explain evidence to support the formation of the universe, which has been expanding for approximately 15 billion year (e.g. ratio of gases, red-shift from distant galaxies, and cosmic background radiation).</p> |
| <p>SC.912.E.5.2:</p> | <p>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</p> <p>Remarks/Examples: Identify patterns that influence the formation, heirarchy, and motions of the various kinds of objects in the solar system and the role of gravity and inertia on these motions (include the Sun, Earth, and Moon, planets, satellites, comets, asteroids, star clusters, galaxies, galaxy clusters). Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space.</p> <p>Florida Standards Connections: MAFS.K12.MP.7: Look for and make use of structure.</p> |
| <p>SC.912.E.5.4:</p> | <p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p>Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal mass ejections, and nuclear reactions) and the impact of the Sun as the main source of external energy for the Earth.</p> |
| <p>SC.912.E.5.7:</p> | <p>Relate the history of and explain the justification for future space exploration and continuing technology development.</p> <p>Remarks/Examples: Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.</p> |
| <p>SC.912.E.5.8:</p> | <p>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</p> |

| | |
|--------------------------------------|--|
| | <p>Remarks/Examples: Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.</p> |
| <p>SC.912.E.6.1:</p> | <p>Describe and differentiate the layers of Earth and the interactions among them.</p> <p>Remarks/Examples: Recognize the importance of the study of seismic wave data and how it can be used to determine the internal structure, density variations, and dynamic processes between Earth's layers.</p> |
| <p>SC.912.E.6.2:</p> | <p>Connect surface features to surface processes that are responsible for their formation.</p> <p>Remarks/Examples: Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.</p> |
| <p>SC.912.E.6.3:</p> | <p>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</p> <p>Remarks/Examples: Discuss the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. Compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). Explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).</p> |
| <p>SC.912.E.7.1:</p> | <p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves</p> |

| | |
|--------------------------------------|--|
| | <p>among reservoirs in the solid earth, oceans, atmosphere and living organisms as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by energy from within the Earth and from the Sun.</p> |
| <p>SC.912.E.7.3:</p> | <p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p>Remarks/Examples: Interactions include transfer of energy (biogeochemical cycles, water cycle, ground and surface waters, photosynthesis, radiation, plate tectonics, conduction, and convection), storms, winds, waves, erosion, currents, deforestation and wildfires, hurricanes, tsunamis, volcanoes.</p> |
| <p>SC.912.P.8.1:</p> | <p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)</p> |
| <p>SC.912.P.8.2:</p> | <p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss volume, compressibility, density, conductivity, malleability, reactivity, molecular composition, freezing, melting and boiling points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, evaporation).</p> |
| <p>SC.912.P.8.3:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</p> <p>Remarks/Examples: Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and “gold foil” experiment), and Bohr (planetary model of atom), and understand how each discovery leads to modern atomic theory.</p> |

| | |
|---------------------------------------|---|
| | <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.4:</p> | <p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.</p> |
| <p>SC.912.P.8.5:</p> | <p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the periodic table and electron configuration to determine an element's number of valence electrons and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer electron shell.</p> |
| <p>SC.912.P.8.7:</p> | <p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ → NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p> |
| <p>SC.912.P.10.7:</p> | <p>Distinguish between endothermic and exothermic chemical processes.</p> <p>Remarks/Examples: Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).</p> |

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

[SC.912.P.10.1:](#)

Remarks/Examples:

Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy then to heat and sound energy when the object hits the ground.

[SC.912.P.10.4:](#)

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

[SC.912.P.10.20:](#)

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Remarks/Examples:

Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.

[SC.912.P.12.3:](#)

Interpret and apply Newton's three laws of motion.

Remarks/Examples:

Explain that when the net force on an object is zero, no acceleration occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law). Explain that when a net force is applied to an object its motion will change, or accelerate (according to Newton's

| | |
|---------------------------------------|--|
| | <p>second law, $F = ma$). Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: $F_1 \text{ on } 2 = -F_2 \text{ on } 1$ (Newton's third law).</p> |
| <p>SC.912.L.14.4:</p> | <p>Compare and contrast structure and function of various types of microscopes.</p> |
| <p>SC.912.L.14.1:</p> | <p>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</p> <p>Remarks/Examples: Describe how continuous investigations and/or new scientific information influenced the development of the cell theory. Recognize the contributions of scientists in the development of the cell theory.</p> |
| <p>SC.912.L.14.2:</p> | <p>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</p> |
| <p>SC.912.L.14.3:</p> | <p>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.14.2.</p> |
| <p>SC.912.L.14.7:</p> | <p>Relate the structure of each of the major plant organs and tissues to physiological processes.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC.</p> |
| <p>SC.912.L.15.1:</p> | <p>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</p> <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.10 SC.912.N.1.3 SC.912.N.1.4 SC.912.N.1.6 SC.912.N.2.1 SC.912.N.3.1 and SC.912.N.3.4.</p> |
| <p>SC.912.L.15.4:</p> | <p>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</p> |

| | |
|---------------------------------|---|
| SC.912.L.15.5: | <p>Explain the reasons for changes in how organisms are classified. Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> |
| SC.912.L.15.6: | <p>Remarks/Examples: Annually Assessed on Biology EOC. Also assesses SC.912.L.15.4 SC.912.L.15.5 SC.912.N.1.3 and SC.912.N.1.6.</p> |
| SC.912.L.15.8: | <p>Describe the scientific explanations of the origin of life on Earth.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.</p> |
| SC.912.L.16.1: | <p>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.2.</p> |
| SC.912.L.16.14: | <p>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</p> |
| SC.912.L.16.16: | <p>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</p> |
| SC.912.L.16.17: | <p>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</p> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.16.8 SC.912.L.16.14 SC.912.L.16.16.</p> |
| SC.912.L.17.2: | <p>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</p> |
| SC.912.L.17.3: | <p>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</p> |
| SC.912.L.17.4: | <p>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</p> |

| | |
|--|---|
| <p>SC.912.L.17.9:</p> | <p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.E.7.1.</p> </div> |
| <p>SC.912.L.17.11:</p> | <p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</p> |
| <p>SC.912.L.18.1:</p> | <p>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.</p> </div> |
| <p>SC.912.L.18.7:</p> | <p>Identify the reactants, products, and basic functions of photosynthesis.</p> |
| <p>SC.912.L.18.8:</p> | <p>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</p> |
| <p>SC.912.L.18.9:</p> | <p>Explain the interrelated nature of photosynthesis and cellular respiration.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10.</p> </div> |
| <p>SC.912.L.18.12:</p> | <p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Remarks/Examples: Annually assessed on Biology EOC.</p> </div> |
| <p>MAFS.912.N-Q.1.1:</p> | <p>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</p> |
| <p>MAFS.912.N-Q.1.3:</p> | <p>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</p> |
| <p>LAFS.910.SL.1.1:</p> | <p>Initiate and participate effectively in a range of collaborative</p> |

discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

[LAFS.910.SL.1.2:](#)

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

[LAFS.910.SL.1.3:](#)

Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

[LAFS.910.SL.2.4:](#)

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

[LAFS.910.SL.2.5:](#)

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

[LAFS.910.RST.1.1:](#)

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

[LAFS.910.RST.1.2:](#)

Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

| | |
|------------------------------------|---|
| LAFS.910.RST.1.3: | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |
| LAFS.910.RST.2.4: | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. |
| LAFS.910.RST.2.5: | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). |
| LAFS.910.RST.2.6: | Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. |
| LAFS.910.RST.3.7: | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| LAFS.910.RST.3.8: | Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. |
| LAFS.910.RST.3.9: | Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |
| LAFS.910.RST.4.10: | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. |
| LAFS.910.WHST.1.1: | <p>Write arguments focused on <i>discipline-specific content</i>.</p> <ol style="list-style-type: none"> a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the |

| | |
|-------------------------------------|--|
| | <p>discipline in which they are writing.</p> <p>e. Provide a concluding statement or section that follows from or supports the argument presented.</p> |
| LAFS.910.WHST.1.1e: | <p>Provide a concluding statement or section that follows from or supports the argument presented.</p> |
| LAFS.910.WHST.1.2: | <p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ol style="list-style-type: none"> a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| LAFS.910.WHST.2.4: | <p>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> |
| LAFS.910.WHST.2.5: | <p>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> |
| LAFS.910.WHST.2.6: | <p>Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.</p> |

| | |
|--|---|
| <u>LAFS.910.WHST.3.7:</u> | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| <u>LAFS.910.WHST.3.8:</u> | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| <u>LAFS.910.WHST.3.9:</u> | Draw evidence from informational texts to support analysis, reflection, and research. |
| <u>LAFS.910.WHST.4.10:</u> | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| <u>ELD.K12.ELL.1.1:</u> | English language learners communicate for social and instructional purposes within the school setting. |
| <u>ELD.K12.ELL.XX.1:</u> | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |