Earth/Space Science Honors (2001320) Scope and Sequence

Unit	Standards	Suggested Timeframe
Unit 1: Practice of Science	SC.912.N.1.1, SC.912.N.1.3, SC.912.N.1.4, SC.912.N.1.5, SC.912.N.1.6, SC.912.N.2.1, SC.912.N.2.2, SC.912.N.2.3, SC.912.N.2.4, SC.912.N.2.5, SC.912.N.3.1, SC.912.N.3.4, SC.912.N.3.5, SC.912.N.4.1, SC.912.N.4.2	2 weeks and embedded throughout the year
Unit 2: Meteorology	SC.912.E.7.1, SC.912.E.7.2, SC.912.E.7.5, SC.912.E.7.6, SC.912.E.7.8, SC.912.P.10.4	3 weeks
Unit 3: Climatology	SC.912.E.7.1, SC.912.E.7.2, SC.912.E.7.3, SC.912.E.7.4, SC.912.E.7.7, SC.912.E.7.8, SC.912.E.7.9, SC.912.P.10.4	6 weeks
Unit 4: Geologic Processes & Features	SC.912.E.6.1, SC.912.E.6.2, SC.912.E.6.3, SC.912.E.6.4, SC.912.E.6.5, SC.912.P.10.4, SC.912.P.10.20	5 weeks
Unit 5: Fossils and Evolution	SC.912.L.15.1, SC.912.L.15.8, SC.912.P.10.11	3 weeks
Unit 6: Formation of the Universe	SC.912.E.5.1, SC.912.E.5.2, SC.912.E.5.11, SC.912.P.10.10, SC.912.P.10.19	4 weeks
Unit 7: Star Properties and Evolution	SC.912.E.5.3, SC.912.E.5.4, SC.912.E.5.10, SC.912.P.10.11, SC.912.P.12.4, SC.912.P.10.16, SC.912.P.10.18	5 weeks
Unit 8: Planetary Systems	SC.912.E.5.5, SC.912.E.5.6, SC.912.P.10.10, SC.912.P.12.2, SC.912.P.12.4	4 weeks
Unit 9: Space Exploration	SC.912.E.5.7, SC.912.E.5.8, SC.912.E.5.9, SC.912.E.5.10	4 weeks

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.

Additional standards/ practices that are to be taught in this course:

- 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.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.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 relationship 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.
- 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.
- 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.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.S-IC.2.6: Evaluate reports based on data. ★
- MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots). ★
- 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. ★
- 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). ★
- 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.

Florida Standards for Mathematical Practice:
Integrate Common Core 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 Standards:

- ELD.K12.ELL.SC.1 English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
- ELD.K12.ELL.SI.1 English language learners communicate for social and instructional purposes within the school setting.

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

CPALMS:
There are more than 1299 related instructional/educational resources, 189 student resources, and 106 parent resources available for this course on CPALMS. Click on the following link to access them: http://www.cpalms.org/Public/PreviewCourse/Preview/4340

Course: Earth/Space Science Honors (2001320)	Unit 1: Practice of Science	**Length of Unit:** 2 weeks and embedded throughout the course

Included Standards: SC.912.N.1.1, SC.912.N.1.3, SC.912.N.1.4, SC.912.N.1.5, SC.912.N.1.6, SC.912.N.2.1, SC.912.N.2.2, SC.912.N.2.3, SC.912.N.2.4, SC.912.N.2.5, SC.912.N.3.1, SC.912.N.3.4, SC.912.N.3.5, SC.912.N.4.1, SC.912.N.4.2

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Generate and test a scientific investigation
Score 3.0	**The student will identify and pose questions about the natural world, articulate the purpose of the investigation, be able to use appropriate tools, and identify the relevant scientific concepts.** **Performs complex skills:** ☐ Conduct systematic observations and organize them in a clear and replicable matter (N.1.1) ☐ Differentiate between independent variable and dependent variable (N.1.1) ☐ Identify what is known in light of empirical evidence whether it can be interpreted in terms of existing knowledge and models or, if not, modify or develop new models (N.1.1) ☐ Identify what tools to gather, analyze, and interpret data (examples: measurements and conversions in metrics and other systems, temperature scales (Celsius and Kelvin), scientific notation, standard notation, significant figures, percent error, accuracy and precision, exponents, dimensional analysis) (N.1.1) ☐ Determine the density of an unknown substance using the appropriate tools. (N.1.1) ☐ Generate explanations that explicate or describe natural phenomena (inferences). (N.1.1) ☐ Generate and interpret graphical representations of data, including data tables and graphs (N.1.1) ☐ Evaluate results of data and draw conclusions and communicate results with others (N.1.1) ☐ 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. (N.2.5) ☐ 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. (N.3.1) ☐ Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. (N.4.1) ☐ 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. (N.4.2) **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** science methods, problem, data, analyze, measurement, metric system, data tables, graphs, investigation, interpret data, evaluate, merits, accuracy, precision, calibration, scales, probeware, meter stick, inferring, empirical evidence, outcome (dependent) variable, test (independent) variable, controlled variables, mass, volume, density, scientific notation, testable question, hypothesis, replicable, sample size, pseudoscience, falsification, durable, robust, theories, scientific argumentation, procedure, observations, safety, models **Performs basic skills:** ☐ Describe scientific methodology (N.1.1) ☐ Describe the relationship between hypothesis and experimentation (N.1.1)

	☐ Describe the relationship between independent and dependent variables (N.1.1) ☐ 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. (N.1.3) ☐ Identify sources of information and assess their reliability according to the strict standards of science. (N.1.4) ☐ Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. (N.1.5) ☐ Describe how scientific inferences are drawn from observations and provide examples from the content being studied. (N.1.6) ☐ Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data. (N.1.6) ☐ Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). (N.2.1) ☐ 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. (N.2.2) ☐ Identify examples of pseudoscience (such as astrology, phrenology) in society. (N.2.3) ☐ 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. (N.2.4) ☐ 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. (N.2.5) ☐ Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence. (N.3.1) ☐ Recognize that theories do not become laws, nor do laws become theories are well supported explanations and laws are well supported descriptions. (N.3.4) ☐ Describe the function of models in science. (N.3.5) ☐ Identify the wide range of models used in science (N.3.5) ☐ Describe how models are used by scientists to explain observations of nature. (N.3.5) ☐ 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. (N.4.1) **No major errors or omissions regarding the score 2.0content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 2: Meteorology	Length of Unit: 3 weeks

Included Standards: SC.912.E.7.1, SC.912.E.7.2, SC.912.E.7.5, SC.912.E.7.6, SC.912.E.7.8, SC.912.P.10.4

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Develop a strategy that overcomes errors in weather prediction
Score 3.0	**The student will understand the limitations of weather prediction and be able to describe the factors that lead to various weather conditions.** **Performs complex skills:** ☐ Analyze the movement of matter and energy through the different biogeochemical cycles including water and carbon. (**SC.912.E.7.1)** ☐ Explain the water cycle as a contributing factor to weather. (**SC.912.E.7.1)** ☐ Analyze the causes of 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. (**SC.912.7.2)** ☐ Predict future weather conditions based on present observations. (**SC.912.E.7.5)** ☐ Read and interpret weather maps/weather tools to determine current weather conditions. (**SC.912.E.7.5)** ☐ Differentiate between accuracy of short range and long range weather forecasts. (**SC.912.E.7.5)** ☐ Compare and contrast physical factors that affect the formation of severe weather. (**SC.912.E.7.6)** ☐ Describe how weather conditions can affect human behavior **(SC.912.E.7.8)** ☐ 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.10.4)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** precipitation, latent heat, evaporation, condensation, humidity, saturated, relative humidity, dew point, hygrometer, anemometer, wind vane, thermometer, barometer, troposphere, stratosphere, mesosphere, thermosphere, ozone, air pressure, pressure gradient, Coriolis effect, vortex, El Nino, La Nina, tornado, hurricane, Southern Oscillation, upwelling, freshwater influx, Labrador Current, Gulf Stream Current, flash floods, thunderstorms, drought, convection, conduction, radiation, and temperature **Performs basic skills:** ☐ Describe the water cycle. (**SC.912.E.7.1)** ☐ Describe the carbon cycle. (**SC.912.E.7.1)** ☐ Explain how surface and deep water circulation patterns (Coriolis effect, El Niño, La Niña, Southern Oscillation, upwelling, ocean surface cooling, freshwater influx, density differences, Labrador Current, and Gulf Stream) impact energy transfer in the environment. (**SC.912.7.2)** ☐ Recognize limitations and uncertainties of weather predictions. (**SC.912.E.7.5)** ☐ Identify the causes of severe weather. (**SC.912.E.7.6)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 3: Climatology	Length of Unit: 6 weeks

Included Standards: SC.912.E.7.1, SC.912.E.7.2, SC.912.E.7.3, SC.912.E.7.4, SC.912.E.7.7, SC.912.E.7.8, SC.912.E.7.9, SC.912.P.10.4

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research the scientific evidence that supports climate change on Earth.
Score 3.0	**The student will understand the natural and anthropogenic mechanisms that affect global climate and how climate change can influence human behavior.** **Performs complex skills:** ☐ Describe how elements such as carbon and nitrogen cycle through different Earth systems (atmosphere, hydrosphere, biosphere, cryosphere, geosphere) **(SC.912.E.7.1)** ☐ Analyze the movement of matter and energy through the different biogeochemical cycles including water and carbon. (SC.912.E.7.1) ☐ Explain how surface and deep water motion within the ocean impacts energy transfer in the environment. (SC.912.E.7.2) ☐ Describe the various interactions among Earth's systems including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. (SC.912.E.7.3) ☐ Describe how latitude, altitude, topography, proximity to large bodies of water, vegetation, ocean currents and prevailing winds determine climate of a geographic area. (SC.912.E.7.4) ☐ Describe how Florida's atmospheric, oceanic and hydrologic conditions influence human behavior(SC.912.E.7.8) ☐ Explain how the ocean's storage of CO2 can impact global climate. (SC.912.E.7.7) Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change. (SC.912.E.7.7) **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** Tropical, Temperate, Polar, Latitude, Altitude, Greenhouse effect, Renewable resource, Nonrenewable resource, Fossil fuel, Fracking, Tar sand, Hydroelectricity, Geothermal energy, Point source pollution, Nonpoint source pollution, Runoff, Global warming, Conservation, Recycling, Water cycle, Transpiration, Gradient, Discharge, Water table, Aquifer, Groundwater, Sinkhole, Glacier, Deflation **Performs basic skills:** ☐ Describe that the Earth system contains a fixed amount of each stable chemical element. (**SC.912.E.7.1)** ☐ Describe how each element moves among reservoirs in the solid Earth, oceans, atmosphere, and living organisms as part of biochemical cycles (i.e. nitrogen, water, carbon, oxygen and phosphorus) which are driven by energy from within the Earth and from the Sun. (**SC.912.E.7.1)** ☐ Describe 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. **(SC.912.E.7.2)** ☐ Describe interactions among Earth's systems that include a 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.7.3)** ☐ Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans. (**SC.912.E.7.4)** ☐ 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. **(SC.912.E.7.7)** ☐ 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.7.8)** ☐ Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.**(SC.912.E.7.9)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 4: Geologic Processes & Features	Length of Unit: 5 weeks

Included Standards: SC.912.E.6.1, SC.912.E.6.2, SC.912.E.6.3, SC.912.E.6.4, SC.912.E.6.5, SC.912.P.10.4, SC.912.P.10.20

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Create a structure that can withstand Plate Tectonic Movement without being damaged
Score 3.0	**The student will understand the origin of geologic features on land and the ocean floor and the processes that result from plate tectonics.** **Performs complex skills:** ☐ Differentiate the layers of Earth and the interactions among them. (**SC.912.E.6.1)** ☐ Connect surface features to surface processes that are responsible for their formation. (**SC.912.6.2)** ☐ 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)** ☐ Compare and contrast the three primary types of plate boundaries (**SC.912.6.3)** ☐ Explain the origin of geological features and processes that result from Plate Tectonics. (**SC.912.6.3)** ☐ Analyze how specific geologic processes and features are expressed in Florida and elsewhere. (**SC.912.6.4)** ☐ Describe the topography of the ocean floor. (**SC.912.6.5)** ☐ Describe the geologic development of the present day oceans and identify the commonly found features. (**SC.912.6.5)** ☐ 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.10.4)** ☐ Describe the measurable properties of waves, specifically seismic 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)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** earthquake, fault, focus, seismic waves, epicenter, elastic rebound, aftershock, P wave, S wave, surface wave, seismograph, moment magnitude, liquefaction, tsunami, crust, mantle, lithosphere, asthenosphere, outer core, inner core, Moho, Continental drift, Pangaea, sonar, deep-ocean trench, Mid-ocean ridge, Rift valley, Sea-floor spreading, Subduction, Paleomagnetism, Plate, Plate tectonics, Divergent boundary, Convergent boundary, Transform fault boundary, Continental Volcanic arc, Volcanic island arc, Convection current, Slab-pull, Ridge-push, Mantle plume, Decompression melting, Intraplate volcanism, Hot spot, Viscosity, Vent, Pyroclastic material, Volcano, Caldera, Magma, Lava, Deformation, Stress, Strain, Isostasy, Anticline, Syncline, Monocline, normal fault, Reverse fault, Thrust fault, Strike-slip fault **Performs basic skills:** ☐ 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. (**SC.912.E.6.1)** ☐ Identify the layers of the Earth. (**SC.912.E.6.1)** ☐ 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.912.6.2)** ☐ Explain the development of the Plate Tectonic Theory as a combination of two theories: continental drift and sea floor spreading. (**SC.912.6.3)** ☐ Describe the effect of ocean and gulf water currents, gravel mining, beach erosion, dune development, aquifers, ground water, saltwater intrusion, springs, and sink holes on the formation of the Florida Peninsula. (**SC.912.6.4)** ☐ Explain the effects of latitude, elevation, topography, proximity to large bodies of water, and temperature of ocean currents on climate in Florida. (**SC.912.6.4)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 5: Fossils and Evolution	Length of Unit: 3 weeks

Included Standards: SC.912.L.15.1, SC.912.L.15.8, SC.912.P.10.11

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research in depth the scientific theories that are supported by the fossil record and other theories and make conclusions. **(SC.912.L.15.1)**
Score 3.0	**The student will understand how the scientific theory of evolution is supported by the fossil record.** **Performs complex skills:** ☐ Differentiate how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change. **(SC.912.L.15.1)** ☐ Form conclusions on the scientific explanations of the origin of life on Earth. **(SC.912.L.15.8)** ☐ 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)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** Uniformitarianism, Relative dating, Law of Superposition, Principle of original horizontality, Principle of cross-cutting relationships, Unconformity, Fossil, Principle of fossil succession, Theory of Evolution, Natural Selection, Adaptation, Index fossil, Radioactivity, Half-life, Radiometric dating, Radiocarbon dating, Geologic Time Scale, Eon, Era, Period, Epoch, alpha, beta, gamma, radioactive decay, fission, fusion, composition, mass, charge, and penetrating power **Performs basic skills:** ☐ Explain Relative Dating**(SC.912.L.15.1)** ☐ Recognize the major geologic periods of Earth's history**(SC.912.L.15.8)** ☐ Align the development of Plants and Animals to appropriate geologic periods **(SC.912.L.15.8)** ☐ Describe the different types of fossils and the conditions that create them **(SC.912.L.15.1)** ☐ Explain radiometric dating and Carbon-14 dating(**SC.912.P.10.11)** ☐ Calculate the age of an unstable isotope when given the ½ life and parent/daughter ratio(**SC.912.P.10.11)** ☐ Describe the scientific explanation of the origin of life**(SC.912.L.15.8)** ☐ Identify the tree main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power.) (**SC.912.P.10.11)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 6: Formation of the Universe	Length of Unit: 4 weeks

Included Standards: SC.912.E.5.1, SC.912.E.5.2, SC.912.E.5.11, SC.912.P.10.10, SC.912.P.10.19

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research and explain dark matter and dark energy
Score 3.0	**The student will understand the formation, organization and distribution of matter in the universe.** **Performs complex skills:** ☐ Explain the supporting evidence of the Big Bang theory (**SC.912.E.5.1)** ☐ Explain the supporting evidence of universe expansion (**SC.912.E.5.1)** ☐ Identify patterns in the universe and the forces that determine them (**SC.912.E.5.2)** ☐ Apply appropriate astronomical distance units to the universe (**SC.912.E.5.11)** ☐ Describe the gravitational force between two objects based on their mass and distance from one another (**SC.912.E.5.2)** ☐ Distinguish between objects that are black body radiators and those that are not (**SC.912.P.10.19)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** Cosmic background radiation, Big Bang Theory, Red shift, Light year, Parallax, Doppler shift, Galaxy, Galaxy cluster, Blackbody radiator, Milky Way, Local group, gravity inertia, Sun, Earth, Moon, planets, satellites, comets, asteroids, star clusters, constellations, astronomical units, and electromagnetic radiation **Performs basic skills:** ☐ Describe the scientific theory of the Big Bang (**SC.912.E.5.1)** ☐ Describe how mass and gravity are related **(SC.912.E.5.2)** ☐ Describe how distance and gravity are related (**SC.912.E.5.2)** ☐ Recognize that the universe contains many billions of galaxies, and each galaxy contains many billions of stars. (**SC.912.E.5.2)** ☐ Recognize that constellations are contrived associations of stars that do not reflect functional relationships in space (**SC.912.E.5.2)** ☐ Recognize that distance in space can be measured in light years and astronomical units (**SC.912.E.5.11)** ☐ Explain that all objects emit and absorb electromagnetic radiation (**SC.912.P.10.19)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 7: Star Properties and Evolution	Length of Unit: 5 weeks

Included Standards: SC.912.E.5.3, SC.912.E.5.4, SC.912.E.5.10, SC.912.P.10.11, SC.912.P.12.4, SC.912.P.10.16, SC.912.P.10.18

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Relate evolution of stars to the age of the universe
Score 3.0	**The student will understand the physical properties and evolution of stars, including the Sun.** **Performs complex skills:** ☐ Predict how the initial mass of a star determines its evolution. (**SC.912.E.5.3)** ☐ Compare and contrast the evolution of stars of different masses (**SC.912.E.5.3)** ☐ Differentiate between the different types of stars found on the Hertzsprung-Russell diagram. (**SC.912.E.5.3)** ☐ Explain the how the H-R Diagram is constructed and how each axis is determined, including mass, magnitude and temperature **(SC.912.E.5.3)** ☐ Differentiate the balance between gravitational collapse and nuclear fusion in determining the color, brightness, and life span of a star. (**SC.912.E.5.3)** ☐ Describe and apply the coordinate system used to locate objects in the sky. (E.5.10) ☐ Compare nuclear reactions (radioactive decay, fission, and fusion) the energy changes associated with them and their associated safety issues. **P.10.11** ☐ Compare the properties of the three main types of radioactive decay (composition, mass, charge, and penetrating power) **SC.912.P.10.11** ☐ 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. **SC.912.P.12.4** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** gravity, Inverse square, Radioactive decay, Nuclear fission, Alpha, Beta, Gamma, Apparent magnitude, Absolute magnitude, H-R Diagram, Nebula, Protostar, Main- sequence star, Red Giant, Red Supergiant, Planetary nebula, White dwarf, Black hole, Neutron star, Pulsar, Solar flare, Sunspot, Aurora, Nuclear Fusion, Coronal mass ejection, Prominence, Chromosphere, Photosphere, Convection, Corona, Granules, Electromagnetic spectrum, radiation, and Nuclear Reaction **Performs basic skills:** ☐ Describe how the initial mass of a star determines its evolution. **SC.912.E.5.3** Identify the evolution of stars of different masses including the three outcomes of stellar evolution: black hole, neutron star, white dwarf. **SC.912.E.5.3** ☐ Describe the balance between nuclear fusion and gravitational collapse **SC.912.E.5.3** ☐ Explain nuclear fusion as a process of stellar evolution **SC.912.E.5.3** 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** ☐ Describe the physical properties of the Sun. **SC.912.E.5.4** ☐ Describe the impact of the Sun as the main source of external energy for the Earth. **SC.912.E.5.4** Explain nuclear reactions (radioactive decay, fission, and fusion) the energy changes associated with them and their associated safety issues. **P.10.11** ☐ Identify the three types of radioactive decay (alpha, beta, and gamma). **SC.912.P.10.11** ☐ Recognize that E=mc2 indicates stellar energy output. **SC.912.P.10.11** ☐ Describe the gravitational force between two objects based on their mass and distance from one another.**SC.912.P.12.4** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 8: Planetary Systems	Length of Unit: 4 Weeks

Included Standards: SC.912.E.5.5, SC.912.E.5.6, SC.912.P.10.10, SC.912.P.12.2, SC.912.P.12.4

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Justify your position on the existence life outside our Solar System
Score 3.0	**The student will understand how evidence from the Solar System and extra solar planetary systems supports Nebular theory of the formation of planetary systems.** **Performs complex skills:** ☐ 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.5.5)** ☐ Develop connections through physical principals 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)** ☐ Analyze the motion of a 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)** ☐ 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. (**SC.912.P.12.4)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** Kepler's 3 Laws of Planetary Motion, Universal Gravitation, Newton's 3 Laws of Motion, Precession, Ellipse, Astronomical Unit, Nebula, Solar System, Planetary System, Orbits, gravity, velocity, and acceleration **Performs basic skills:** ☐ Describe the Nebular theory of the formation of planetary systems. (**SC.912.E.5.5)** ☐ Explain Kepler's three laws of planetary motion (**SC.912.E.5.6)** ☐ Describe planetary motion relates to Newton's laws of Motion and Universal Gravitation (**SC.912.E.5.6)** ☐ Describe the motions of Earth including rotation, revolution and precession (**SC.912.E.5.6)** ☐ Explain the effects of the Sun on Earth (**SC.912.E.5.6)** ☐ Explain the effects of the Moon on Earth (**SC.912.E.5.6)** ☐ Recognize the phases of the Moon and what causes them. (**SC.912.E.5.6)** ☐ Recognizing the effect of gravity on the Sun, Earth, and Moon. **(SC.912.P.10.10)** ☐ Describe the gravitational force between two objects based on their mass and distance from one another. (**SC.912.P.12.4)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Course: Earth/Space Science Honors (2001320)	Unit 9: Space Exploration	Length of Unit: 4 weeks

Included Standards: SC.912.E.5.7, SC.912.E.5.8, SC.912.E.5.9, SC.912.E.5.10

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Justify the future exploration of space.
Score 3.0	**The student will understand how technology impacts the past, present and future of space exploration and society.** **Performs complex skills:** ☐ Analyze the broad effects of space exploration on the economy and culture of Florida. (**SC.912.E.5.9)** ☐ Describe how the electromagnetic spectrum is detected through various examples of technology. (**SC.912.E.5.9)** ☐ Relate the history of and explain the justification for future space exploration and continuing technology development. (E.5.7) ☐ Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. (E.5.8) ☐ Describe and apply the coordinate system used to locate objects in the sky. (E.5.10) **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology:** Spectroscopy, Radio telescope, Optical telescope, Radio interferometer, Refracting telescope, Reflecting telescope, chromatic aberration, objective, focus, and resolution **Performs basic skills:** ☐ Describe how spectroscopy is used to detect and infer information from electromagnetic radiation sources. (**SC.912.E.5.9)** ☐ Recognize the economic, technical, and social benefits of spinoff technology developed through the space program. (**SC.912.E.5.9)** ☐ Identify different types of technology used to explore space. (**SC.912.E.5.9)** ☐ Identify examples of space exploration in history. (**SC.912.E.5.9)** ☐ Recognize examples of technologies that have been modified to advance society. (**SC.912.E.5.9)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.