**Science**

Task Neutral Scoring Criteria

Grades 9-12

Updated 7/15/17

Key: **E** = Earth Science; **L** = Life Science; **P** = Physical Science; **LAFS** = Language Arts for Science

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| **Competency #1: Ask Questions & Explore Explanations**  Students will ask questions of each other about texts, the features of the phenomena they observe, and the conclusions they draw from their scientific investigations. | | | | |
| **Performance Indicator** | **1 - Emerging** | **2 - Progressing** | **3 - Proficient** | **4 - Exceeds** |
| **E.7.5** Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions. | Identify weather conditions using weather data and weather maps. | Record data regarding current weather conditions. | Determine a future weather condition using observations and known patterns. Identify the limitations of these predictions. | Recognize the economic, environmental and societal impacts of weather, and understand limitations of these predictions. |
| **E.7.3** Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. | Identify and describe each of Earth’s spheres. | Make connections between Earth’s spheres. | Given a specific interaction, be able to distinguish which of Earth’s spheres were involved in that interaction. | Predict how Earth’s spheres would be affected by a change involving one or more of Earth’s spheres. |
| **L.14.1** Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science. | Identify the parts of cell theory. | Know the historical contributions that resulted in cell theory. Recognize that science is a process of discovery. | Describe the components of cell theory and draw connections between the discovery of cell theory and the process of science. | Draw parallels between the development of cell theory and another scientific theory. |
| **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. | Define an enzyme, catalyst, pH, activation energy. | Identify factors, such as pH and temperature that impact enzyme activity. | Describe how enzymes lower activation energy in biochemical reactions. Observe and describe the impacts of pH and temperature on enzyme activity. | Design an experiment that demonstrates how changes in factors that effect enzymes alter the rate of chemical reactions. |
| **P.10.1** Differentiate among the various forms of energy and recognize that they can be transformed from one form to others. | Identify the various forms of energy. | Describe examples of energy transformations. Demonstrate and observe these transformations. | Given an observation classify the energy that is being exhibited. Determine what energy transformations have occurred. | Predict future energy transformations and the impact within the system. |
| **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. | Identify the properties of waves. | Describe the relationships of wave properties. Demonstrate and observe these properties. | Given an observation determine how properties of a wave will change when the wave moves from one medium to another. | Conclude the impacts of wave behavior to systems on Earth. |

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| **Competency #2: Develop & Use Models**  Students will create scientific models progressing from concrete to abstract representations of relevant relationships. | | | | |
| **Performance Indicator** | **1 - Emerging** | **2 - Progressing** | **3 - Proficient** | **4 - Exceeds** |
| **E.6.5** Describe the geologic development of the present day oceans and identify commonly found features. | Identify commonly found features on ocean floors. | Describe the topography of the ocean floor. | Create a model of the ocean floor and describe the formation of its features. | Explore the uses of a seafloor model in various sciences and industries. |
| **E.5.4** Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth. | Identify the physical properties of the sun. | Describe observable effects of the Sun on Earth. | Demonstrate the conditions on Earth that are impacted by the Sun’s physical properties and dynamic nature. | Use solar models to predict future impacts the Sun will have on Earth. |
| **L.17.10** Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. | Identify models that illustrate how matter flows through each ecosystems. | Interpret models to summarize how matter flows through a system. | Create and interpret different models to illustrate and formulate an explanation about how matter cycles through ecosystems. | Predict and describe the positive and/or negative consequences humans may pose on biogeochemical cycles in the future with a model. |
| **(L.18.7, L.18.8, L.18.9)** Explain the interrelated nature of photosynthesis and cellular respiration. | Identify reactants and products of photosynthesis and cellular respiration within a model. | Describe the processes of photosynthesis and cellular respiration within a model. | Explain how models show the relationship between photosynthesis and cellular respiration. | Predict how a change in the rate of photosynthesis or cellular respiration will affect a system with a model. |
| **P.8.9** Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions. | Define the mole and the law of conservation of mass. | Describe how to calculate quantities of chemicals given a chemical equation. | Use the mole concept and law of conservation of mass to calculate quantities of chemicals in a given chemical reaction. | Explore the uses of the mole concept and law of conservation of mass within industry and science. |
| **P.8.7** Interpret formula representations of molecules and compounds in terms of composition and structure. | Identify formulas for molecules and common compounds. | Determine what elements are involved in the formula, when given a specific formula. Understand what elements are participating in the formation of that compound. | Construct various models of molecules and compounds. | Use models of molecules and compounds to predict how various bonds will form in chemical reactions. |

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| **Competency #3: Develop & Implement Investigations** **to** **Construct Explanations & Design Solutions** Students will carry out several different kinds of investigations ranging from teacher generated to inquiry based.  Students will demonstrate understanding of the applications of a scientific idea by developing explanations of phenomena, whether based on observations they have made or models they have developed. | | | | |
| **Performance Indicator** | **1 - Emerging** | **2 - Progressing** | **3 - Proficient** | **4 - Exceeds** |
| **E.6.2** Connect surface features to surface processes that are responsible for their formation. | Identify surface features on Earth. | Describe surface processes that shape Earth. | Connect observed surface features on Earth to surface processes that are responsible for their formation. | Design a demonstration that portrays the surface process that forms a surface feature on Earth. |
| **E.6.4** Analyze how specific geologic processes and features are expressed in Florida and elsewhere. | Identify natural geological processes in Florida. | Describe the relationship between specific geological processes and features in Florida and elsewhere. | Analyze observed geologic features and infer the process that caused them in Florida. | Investigate the human impact on various geological features and processes in Florida. |
| **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. | Define and identify examples of natural selection. | Identify the conditions required for natural selection. | Demonstrate and describe the conditions required for natural selection. | Review data to determine whether a species is undergoing natural selection. |
| **L.18.12**  Use the concepts related to the properties of water to explain the phenomena of how water impacts life processes. | Identify the properties of water through inquiry. | Describe properties of water through information obtained during inquiry. | Explore the concepts related to the properties of water through experimentation to explain the phenomena of how water impacts life processes. | Design an investigation and apply the concepts of the properties of water to explain the phenomena of  how water impacts life processes. |
| **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. | Define Law of Conservation of Energy, and open, closed, and isolated systems. Explain how energy is conserved in an isolated system. | Differentiate between the different systems and describe the movement of energy within each system. | Investigate the Law of Conservation of Energy in various systems. Given a system classify if it is closed, open, or isolated. | Choose a system and investigate to determine whether it is open, closed or isolated. |
| **P.10.5** Relate temperature to the average molecular kinetic energy. | Define kinetic energy and temperature. | Describe the relationship between temperature and kinetic energy. | Collect data on temperature changes and use graphic analysis to infer changes in kinetic energy. | Design a controlled experiment where the dependent variable is a change in temperature. |

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| **Competency #4: Analyze & Interpret Data for Critical Thinking**  Students will reveal any patterns or relationships, organize and interpret data through tabulating, graphing, or statistical analysis.  Students will compute and manipulate data by applying the mathematical practices in science. | | | | |
| **Performance Indicator** | **1 - Emerging** | **2 - Progressing** | **3 - Proficient** | **4 - Exceeds** |
| **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. | Graph temperature differences within surface and deep water currents. | Diagram how energy is transferred as water moves between the poles and equator. | Collect, symbolize and interpret the causes of various surface and deep water currents. Conclude their impacts on energy transfer between the poles and the equator. | Infer the future impact of global climate change on surface and deep water currents and the impact of energy transfer on earth. |
| **E.7.5** Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions. | Record and symbolize weather data. | Use data to make predictions of future weather conditions and understand that there are limitations. | Use data to make predictions of future weather conditions and recognize the limitations of predictions. | Adjust the prediction based upon new observations and describe how advances in meteorological technology reduces the limitations and uncertainties of weather modeling. |
| **L.17.5** Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. | Gather population data. | Interpret evidence based on population data gathered through graphing. | Analyze population data and provide evidence to support or illustrate the factors that impact population size. | Predict future population trends using multiple data sources. |
| **L.15.15** Describe how mutation and genetic recombination increase genetic variation. | Define mutation, genetic recombination, and genetic variation. | Identify mutations using data. | Describe and demonstrate how mutations and genetic recombination increase genetic variations. | Review data to determine whether mutations and genetic recombination have increased genetic variation. |
| **P.12.12** Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. | Define concentration, temperature, catalyst, and chemical reaction. | Describe how various factors affect the rates of chemical reactions. | Explain and demonstrate the factors affecting the rates of chemical reactions. | Predict how a change in one factor would affect the rate of a chemical reaction. |
| **P.12.10** Interpret the behavior of ideal gases in terms of kinetic molecular theory. | Identify the behavior of gases in terms of kinetic molecular theory. | Determine how gasses behave in terms of the kinetic molecular theory. | Using data, analyze and interpret the behavior of gasses in terms of molecular theory. | Use data to predict other gasses behaviors related to other theories. |

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| **Competency #5: Support a Claim Using Evidence**  Students will support a claim using evidence through explanations they construct, and defend their interpretations of the associated data. | | | | |
| **Performance Indicator** | **1 - Emerging** | **2 - Progressing** | **3 - Proficient** | **4 - Exceeds** |
| **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. | Describe how the Big Bang is considered a theory of the expansion of the universe. | Use models to explain how observed phenomena support the expansion of the universe. | Connect the development of the Big Bang Theory of the origin of the universe with observed phenomena. | Hypothesize how future scientific discoveries will impact the Big Bang Theory |
| **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 | Explain how the ocean serves as a sink and source of heat energy. | Describe the relationship between ocean circulation and energy and matter cycling. | Detect evidence that shows the impact on the ocean on climate change. | Predict how changes in oceanic conditions will affect climate. |
| **L.15.1** Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change. | Identify an evolutionary claim. | Describe the evidence that supports the evolutionary claim. | Draw conclusions utilizing evidence to support various claims within the theory of evolution. | Justify the theory of evolution using various claims, evidence, and reasoning. |
| **L.17.11** Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. | Define renewable resources, non renewable resources. | Identify and describe renewable and non-renewable resources and why they are classified that way. | Evaluate the costs and benefits of renewable and nonrenewable resources utilizing evidence and to support these claims. | Predict the consequences to the Earth if the renewable resources were to disappear. |
| **P.8.2** Differentiate between physical and chemical properties and physical and chemical changes of matter. | Identify physical and chemical properties. | Describe the effects of physical and chemical changes on matter. | Examine the similarities and differences between physical and chemical properties and changes of matter. | Develop an argument using evidence to determine whether an object has undergone either a physical or chemical change. |
| **P.8.1** Differentiate among the four states of matter. | Identify the four states of matter. | Describe each of the four states of matter. | Analyze the differences of the four states of matter. | Classify matter into one of the four states, defending your claim. |

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| **Competency #6: Obtain, Evaluate, & Communicate Information**  Students will read and produce scientific text to present and support findings. | | | | |
| **Performance Indicator** | **1 - Emerging** | **2 - Progressing** | **3 - Proficient** | **4 - Exceeds** |
| **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. | Identify a scientific problem and gather various scientific research. | Analyze and summarize gathered reputable scientific sources. | Write and communicate the findings of the scientific research. | Compose solutions or an argument to the scientific problem gathered citing evidence from the scientific research. |
| **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. | Determine audience to present scientific research. | Analyze and determine the most important pieces of evidence and how to describe them to the audience. | Present the research to the audience in a clear manner, appropriate to the purpose, audience, and task at hand. | Hypothesize what future research could be done on the topic, and who would be the best presenter of that new knowledge. |