Science
Task Neutral Scoring Criteria
Grades 9-12
Updated 9/5/17

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

Competency #1: Ask Questions & Explore Explanations Students will ask questions 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**
A. Predict future weather conditions based on present observations and conceptual models and recognize limitation and uncertainties of such predictions. (E.7.5)	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.	Analyze the economic, environmental and societal importance of weather forecasting, and understand limitations of these predictions.
B. Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. (E.7.3)	Identify and describe each of Earth's systems. .	Make connections between Earth's spheres.	Provide a specific interaction among Earth systems, and explain the contributions and impacts of each system.	Predict how Earth's spheres would be affected by a change involving one or more of Earth's spheres.
C. Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science. (L.14.1)	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 explore how that discovery has impacted our understanding of the nature of science.	Draw parallels between the development of cell theory and another scientific theory.

D. Explain the role of enzymes as catalysts that lower the activation energy of biochemica reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. (L.18.11)	**Define an enzyme, catalyst, pH, activation energy.**	**Explain a catalytic reaction. Identify factors 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.**
E. Differentiate among the various forms of energy and recognize that they can be transformed from one form to others. (P.10.1)	**Identify the various forms of energy.**	**Describe examples of energy transformations.**	**Given an observation classify the forms of energy that are being exhibited. Explain which energy transformations have occurred, which have not, and why.**	**Analyze a complex example of energy transfer.**
F. 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.10.20)	**Identify the properties of waves.**	**Describe the relationships of wave properties. Demonstrate and observe these properties.**	**Given an observation, use data to demonstrate how interrelated properties of a wave change as it moves from one medium to another.**	**Analyze wave behaviors and properties in multiple wave forms (sound, earthquake, ocean, etc.).**

Competency #2: Develop & Use Models Students will develop and critique scientific models progressing from concrete to abstract representations of relevant relationsh				
Performance Indicator	**1 - Emerging**	**2 - Progressing**	**3 - Proficient**	**4 - Exceeds**
A. Describe the geologic development of the present day oceans and identify commonly found features. (E.6.5)	Identify common geologic features on ocean floors.	Describe the topography of the ocean floor and the origins of those features.	Create a model of the ocean floor and describe the ways this model represents the formation of its features.	Critique various models of the ocean floor and use observations to improve upon your model.
B. Explain the physical properties of the Sun and its dynamic nature and connect the properties to conditions and events on Earth. (E.5.4)	Identify the physical properties of the sun.	Describe measureable effects of the Sun on Earth.	Create and defend a model to demonstrate the conditions on Earth that are impacted by the Sun's physical properties and dynamic nature.	Extrapolate the effects of a change in one or more of the sun's properties on conditions on Earth..
C. Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. (L.17.10)	Identify models that illustrate how matter flows through an ecosystem.	Use models to summarize how matter flows through an ecosystem.	Create and annotate an original model to illustrate the flow of matter through ecosystems.	Predict and describe the positive and/or negative consequences humans may pose on biogeochemical cycles now or in the future with a model.
D. Explain the interrelated natur of photosynthesis and cellular respiration. (L.18.7, L.18.8, L.18.9)	Identify reactants and products of photosynthesis and	Describe the processes of photosynthesis and cellular respiration within a model.	Explain how models show the interrelationship of photosynthesis and cellular respiration.	Predict how a change in any aspect of the model will affect all of the parts.

	cellular respiration within a model.			
E. Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions. (P.8.9)	Define the mole and the law of conservation of mass.	Describe how to calculate quantities of chemicals given a chemical equation.	Apply the mole concept and law of conservation of mass to calculate quantities of chemicals in a given chemical reaction.	Create and annotate an original graphic that represents the application of molarity and conservation of mass in reactions.
F. Interpret formula representations of molecules and compounds in terms of composition and structure. (P.8.7)	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 and interpret various models of molecules and compounds in the context of a formula.	Use models of molecules and compounds to predict how various bonds will form in chemical reactions.

Competency #3: Develop & Engage in Investigations to Construct Explanations & Design Solutions Students will engage in the inquiry process by conducting several different kinds of investigations ranging from teacher generate 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.				
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A. Connect surface features to surface processes that are responsible for their formation. (E.6.2)	**Identify surface features on Earth.**	**Describe surface processes that shape Earth.**	**Collect and compile evidence to 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.**
B. Analyze how specific geologi processes and features are expressed in Florida and elsewhere. (E.6.4)	**Identify natural geological processes in Florida.**	**Describe the relationship between specific geological processes and features in Florida and elsewhere.**	**Analyze observed geologic features and infe the process that caused them in Florida and elsewhere.**	**Predict future scenarios for geologic features in Florida or elsewhere as the result of the processes that are affecting them today.**
C. Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, an the struggle to survive, which result in differential reproductive success. (L.15.13)	**Define and identify examples of natural selection.**	**Identify the conditions that create natural selection.**	**Empirically demonstrate and describe the conditions required for natural selection.**	**Review data to understand what natural selection forces are acting on a species.**
D. Use the concepts related to the properties of water to explain the phenomena of how water impacts life processes. (L.18.12)	**Identify the properties of water through inquiry.**	**Describe properties of water using information obtained during inquiry.**	**Apply the properties of water to how these impact living organisms by citing evidence obtained in experimentation.**	**Design and conduct an investigation that applies the properties of water to explaining their impacts on life processes.**

E. 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.10.2)	**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, and analyze the data generated in the investigation. Given a system explain why it is closed, open, or isolated.**	**Critique explanations of various systems and determine how well the explanations demonstrate understanding of the Law of Conservation of Energy.**
F. Relate temperature to the average molecular kinetic energy. (P.10.5)	**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, conduct and critique a controlled experiment to demonstrate the relationship between temperature and kinetic energy.**

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.				
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A. 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. (E.7.2)	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 current and future impact of global climate change on surface and deep water currents and the impacts of energy transfer on earth.
B. Predict future weather conditions based on present observations and conceptual models and recognize limitation and uncertainties of such predictions. (E.7.5)	Record and symbolize weather data.	Use data to make predictions of future weather conditions.	Use data to make predictions of future weather conditions and identify specific limitations of these predictions.	Adjust a predictive model based upon new observations and describe how advances in meteorological technology reduces the limitations and uncertainties of weather modeling.
C. Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. (L.17.5)	Gather population data.	Interpret evidence based on population data gathered through graphing.	Analyze variables within a population database and provide evidence to support or illustrate the environmental factors that impact population size.	Predict future population trends using multiple data sources, and defend the prediction with references to limiting factor data.

D. Describe how mutation and genetic recombination increase genetic variation. (L.15.15)	**Define mutation, genetic recombination, and genetic variation.**	**Identify instances where mutation and genetic variation occur.**	**Using experimental or descriptive data, demonstrate that mutations and genetic recombination increase genetic variations.**	**Analyze an example from nature of these phenomena impacting a population's survival or demise.**
E. Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. (P.12.12)	**Define concentration, temperature, catalyst, and chemical reaction.**	**Describe how various factors affect the rates of chemical reactions.**	**Generate and analyze data to explain and demonstrate the factors affecting the rates of chemical reactions.**	**Use data to graph and predict how a change in one factor would affect the rate of a chemical reaction.**
F. Interpret the behavior of ideal gases in terms of kinetic molecular theory. (P.12.10)	**List properties of gases.**	**Explain how gases behave in terms of the kinetic molecular theory.**	**Using data, analyze and interpret the behavior of gasses in a defined system in terms of molecular theory.**	**Use data to predict behaviors of gases in a variety of unknown systems.**

Competency #5: Support a Claim Using Evidence Students will support a claim using evidence through explanations they construct, and defend their interpretations of the associ data.				
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A. 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. (E.5.1)	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
B. Cite evidence that the ocean has had a significant influence on climate change by absorbing storing, and moving heat, carbon, and water. (E.7.9)	Explain how the ocean serves as a sink and source of heat energy.	Describe the relationship between ocean circulation and energy and matter cycling.	Use evidence to support an argument about the impact of the ocean on climate change.	Predict how changes in oceanic conditions are affecting climate.
C. Explain how the scientific theory of evolution is supported by the fossil record, comparativ anatomy, comparative embryology, biogeography, molecular biology, and observe evolutionary change. (L.15.1)	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.

D. Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. (L.17.11)	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.	Analyze both costs and benefits in a current dilemma that balances renewable and non-renewable resources, and defend a solution.
E. Differentiate between physica and chemical properties and physical and chemical changes of matter. (P.8.2)	Identify physical and chemical properties.	Describe the effects of physical and chemical changes on matter.	Use evidence to determine whether an object has undergone either a physical or chemical change.	Develop an evidence-based argument to justify whether an object has undergone either a physical or chemical change.
F. Differentiate among the four states of matter. (P.8.1)	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 with empirical data.

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
A. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem;	Identify a scientific problem and gather various scientific research.	Analyze and summarize gathered reputable scientific sources.	Write to communicate the design and findings of your scientific research.	Compose solutions or an argument to the scientific problem gathered citing evidence from the scientific research.

narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (LAFS.910.WHST.3.7)				
B. 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.2.4)	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 an 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.