Missouri Science

Grades 6, 7, 8

Adopted 2016

Physical Sciences

PS1. Matter and Its Interactions PS1

A. Structure and Properties of Matter PS1.A

- **A-1.** Develop models to describe the atomic composition of simple molecules and extended structures. 6-8.PS1.A-1
- **A-2.** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. 6-8.PS1.A-2
- **A-3.** Gather, analyze, and present information to describe that synthetic materials come from natural resources and how they impact society. 6-8.PS1.A-3
- **A-4.** Develop a model that describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. 6-8.PS1.A-4

B. Chemical reactions PS1.B

- **B-5.** Develop and use a model to describe how the total number of atoms remains the same during a chemical reaction and thus mass is conserved. 6-8.PS1.B-5
- **B-6.** Construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. 6-8.PS1.B-6

PS2. Motion and Stability: Forces and Interactions PS2

A. Forces and Motion PS2.A

- **A-1.** Apply physics principles to design a solution that minimizes the force of an object during a collision and develop an evaluation of the solution. 6-8.PS2.A-1
- **A-2.** Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. 6-8.PS2.A-2

B. Types of Interaction PS2.B

- **B-3.** Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces. 6-8.PS2.B-3
- **B-4.** Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. 6-8.PS2.B-4
- **B-5.** Conduct an investigation and evaluate the experimental design to provide evidence that electric and magnetic fields exist between objects exerting forces on each other even though the objects are not in contact. 6-8.PS2.B-5

PS3. Energy PS3

A. Definitions of Energy PS3.A

- **A-1.** Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. 6-8.PS3.A-1
- **A-2.** Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. 6-8.PS3.A-2
- **A-3.** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. 6-8.PS3.A-3
- **A-4.** Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the temperature of the sample. 6-8.PS3.A-4

B. Conservation of Energy and Energy Transfer PS3.B

- **B-5.** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. 6-8.PS3.B-5

PS4. Waves and Their Applications in Technologies for Information Transfer PS4

A. Wave Properties PS4.A

A-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. 6-8.PS4.A-1

A-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. 6-8.PS4.A-2

Life Sciences

LS1. From Molecules to Organisms: Structure and Processes LS1

A. Structure and Function LS1.A

A-1. Provide evidence that organisms (unicellular and multicellular) are made of cells and that a single cell must carry out all of the basic functions of life. 6-8.LS1.A-1

A-2. Develop and use a model to describe the function of a cell as a whole and ways parts of the cells contribute to that function. 6-8.LS1.A-2

A-3. Develop an argument supported by evidence for how multicellular organisms are organized by varying levels of complexity; cells, tissue, organs, organ systems. 6-8.LS1.A-3

A-4. Present evidence that body systems interact to carry out key body functions, including providing nutrients and oxygen to cells, removing carbon dioxide and waste from cells and the body, controlling body motion/activity and coordination, and protecting the body. 6-8.LS1.A-4

B. Growth and Development of Organisms LS1.B

B-5. Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively. 6-8.LS1.B-5

B-6. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. 6-8.LS1.B-6

C. Organization for Matter and Energy Flow in Organisms LS1.C

C-7. Construct a scientific explanation based on evidence for the role of photosynthesis and cellular respiration in the cycling of matter and flow of energy into and out of organisms. 6-8.LS1.C-7

LS2. Ecosystems: Interactions, Energy, and Dynamics LS2

A. Interdependent Relationships in Ecosystems LS2.A

- **A-1.** Analyze and interpret data to provide evidence for the effects of resource availability on individual organisms and populations of organisms in an ecosystem. 6-8.LS2.A-1
- **A-2.** Construct an explanation that predicts the patterns of interactions among and between the biotic and abiotic factors in a given ecosystem. 6-8.LS2.A-2

B. Cycles of matter and Energy Transfer in Ecosystems LS2.B

- **B-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. 6-8.LS2.B-3

C. Ecosystems Dynamics, Functioning and Resilience LS2.C

- **C-4.** Construct an argument supported by empirical evidence that explains how changes to physical or biological components of an ecosystem affect populations. 6-8.LS2.C-4
- **C-5.** Evaluate benefits and limitations of differing design solutions for maintaining an ecosystem. 6-8.LS2.C-5

LS4. Biological Evolution; Unity and Diversity LS4

A. Evidence of Common Ancestry and Diversity LS4.A

- **A-1.** Analyze and interpret evidence from the fossil record to infer patterns of environmental change resulting in extinction and changes to life forms throughout the history of the Earth. 6-8.LS4.A-1

B. Natural Selection LS4.B

- **B-2.** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. 6-8.LS4.B-2
- **B-3.** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. 6-8.LS4.B-3

C. Adaptation LS4.C

- **C-4.** Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. 6-8.LS4.C-4

Earth and Space Sciences

ESS1. Earth's Place in the Universe ESS1

A. The Universe and its Stars ESS1.A

- **A-1.** Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon. 6-8.ESS1.A-1
- **A-2.** Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year. 6-8.ESS1.A-2
- **A-3.** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. 6-8.ESS1.A-3

B. Earth and the Solar System ESS1.B

- **B-4.** Analyze and interpret data to determine scale properties of objects in the solar system. 6-8.ESS1.B-4

C. The History of Planet Earth ESS1.C

- **C-5.** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history. 6-8.ESS1.C-5

ESS2. Earth's Systems ESS2

A. Earth Materials and Systems ESS2.A

- **A-1.** Develop and use a model to illustrate that energy from the Earth's interior drives convection which cycles Earth's crust leading to melting, crystallization, weathering and deformation of large rock formations, including generation of ocean sea floor at ridges, submergence of ocean sea floor at trenches, mountain building and active volcanic chains. 6-8.ESS2.A-1
- **A-2.** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. 6-8.ESS2.A-2

B. Plate Tectonics and Large-Scale Systems ESS2.B

- **B-3.** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. 6-8.ESS2.B-3

C. The Role of Water in Earth's Surface Processes ESS2.C

- **C-4.** Design and develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. 6-8.ESS2.C-4
- **C-5.** Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. 6-8.ESS2.C-5
- **C-6.** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. 6-8.ESS2.C-6

ESS3. Earth and Human Activity ESS3

A. Natural Resources ESS3.A

A-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes and human activity. 6-8.ESS3.A-1

B. Natural Hazards ESS3.B

B-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. 6-8.ESS3.B-2

C. Human Impacts on Earth's Systems ESS3.C

C-3. Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's systems. 6-8.ESS3.C-3

C-4. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. 6-8.ESS3.C-4

D. Global Climate Change ESS3.D

D-5. Analyze evidence of the factors that have caused the change in global temperatures over the past century. 6-8.ESS3.D-5

Engineering, Technology, and Application of Science

ETS1. Engineering Design ETS1

A. Defining and Delimiting Engineering Problems ETS1.A

A-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. 6-8.ETS.A-1

B. Developing Possible Solutions ETS1.B

B-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. 6-8.ETS.B-2

B-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. 6-8.ETS.B-3

B-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. 6-8.ETS.B-4