Kentucky Science

Grade 4

Adopted 2022

Grade 4

Physical Science

4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. 4-PS3-1

4-SEPS3-1. Constructing Explanations and Designing Solutions - Use evidence (e.g., measurements, observations, patterns) to construct an explanation. 4-SEPS3-1

A1. Definitions of Energy - The faster a given object is moving, the more energy it possesses. 4-DCI.PS3.A1

PS3-1. Energy and Matter - Energy can be transferred in various ways and between objects. 4-CC.PS3-1

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. 4-PS3-2

4-SEPS3-2. Planning and Carrying Out Investigations - Make observations in order to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. 4-SEPS3-2

A2. Definitions of Energy - Energy can be moved from place to place by moving objects or through sound, light, or electric currents. 4-CC.PS3.A2

B2. Conservation of Energy and Energy Transfer - Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. 4-CC.PS3.B2

PS3-2. Energy and Matter - Energy can be transferred in various ways and between objects. 4-CC.PS3-2

4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. 4-PS3-3

4-SEPS3-3. Asking Questions and Defining Problems - Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause-and-effect relationships. 4-SEPS3-3

A3. Definitions of Energy - Energy can be moved from place to place by moving objects or through sound, light, or electric currents. 4-CC.PS3.A3

B3. Conservation of Energy and Energy Transfer - Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. 4-CC.PS3.B3

C3. Relationship Between Energy and Forces - When objects collide, the contact forces transfer energy so as to change the objects' motions. 4-CC.PS3.C3

PS3-3. Energy and Matter - Energy can be transferred in various ways and between objects. 4-CC.PS3-3

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another 4-PS3-4

4-SEPS3-4. Constructing Explanations and Designing Solutions - Apply scientific ideas to solve design problems. 4-SEPS3-4

B4. Conservation of Energy and Energy Transfer - Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. 4-DCI.PS3.B4

D4. Energy in Chemical Processes and Everyday Life - The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. 4-DCI.PS3.D4

A4. Defining Engineering Problems - Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. 4-DCI.ETS1.A4

PS3-4. Energy and Matter - Energy can be transferred in various ways and between objects. 4-CC.PS3-4

4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. 4-PS4-1

4-SEPS4-1. Developing and Using Models - Develop a model using an analogy, example, or abstract representation to describe a scientific principle. 4-SEPS4-1

A4. Wave Properties - Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). 4-DCI.PS4.A4

PS4-1. Patterns - Similarities and differences in patterns can be used to sort and classify natural phenomena. 4-CC.PS4-1

4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. 4-PS4-2

4-SEPS4-2. Developing and Using Models - Develop a model to describe phenomena. 4-SEPS4-2

B2. Electromagnetic Radiation - An object can be seen when light reflected from its surface enters the eyes. 4-DCI.PS4.B2

2. Cause and Effect - Cause and effect relationships are routinely identified. 4-CC.PS4.2

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information. 4-PS4-3

4-SEPS4-3. Constructing Explanations and Designing Solutions - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. 4-SEPS4-3

C4. Information Technologies and Instrumentation - Patterns can encode, send, receive, and decode information. 4-DCI.PS4.C4

C4. Optimizing the Design Solution - Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. 4-DCI.ETS1.C4

3. Patterns - Similarities and differences in patterns can be used to sort and classify designed products. 4-CC.PS4.3

Life Science

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. 4-LS1-1

4-SEPLS1-1. Engaging in Argument from Evidence - Construct an argument with evidence, data, and/or a model. 4-SEPLS1-1

A4. Structure and Function-Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. 4-DCI.LS1.A4

1. System and System Models - A system can be described in terms of its components and their interactions 4-CC.LS1.1

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. 4-LS1-2

4-SEPLS1-2. Developing and Using Models - Use a model to test interactions concerning the functioning of a natural system. 4-SEPLS1-2

D. Information Processing Different sense receptors are specialized for particular kinds of information, which may then be processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. 4-LS1.D

2. Systems and System Models - A system can be described in terms of its components and their interactions. 4-CC.LS1.2

4-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. 4-LS4-1

4-SEPLS4-1. Analyzing and Interpreting Data - Analyze and interpret data to make sense of phenomena using logical reasoning. 4-SEPLS4-1

A. Evidence of Common Ancestry and Diversity - Some kinds of plants and animals that once lived on Earth are no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. 4-DCI.LS4.A

1. Scale, Proportion, and Quantity - Observable phenomena exist from very short to very long time periods. 4-CC.LS4.1

Earth and Space Science

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. 4-ESS1-1

4-SEPESS1-1. Constructing Explanations and Designing Solutions - Identify the evidence that supports particular points in an explanation. 4-SEPESS1-1

C. The History of Planet Earth - Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. 4-DCI.ESS1.C

ESS1-1. Patterns - Patterns can be used as evidence to support an explanation. 4-CC.ESS1-1

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. 4-ESS2-1

4-SEPESS2-1. Planning and Carrying Out Investigations - Make observations and/or measurements in order to produce data to serve as the basis for evidence for an explanation of a phenomenon. 4-SEPESS2-1

A. Earth Materials and Systems - Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. 4-DCI.ESS2.A

E. Biogeology - Living things affect the physical characteristics of their regions. 4-DCI.ESS2.E

ESS2-1. Cause and Effect - Cause-and-effect relationships are routinely identified, tested, and used to explain change. 4-CC.ESS2-1

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features. 4-ESS2-2

4-SEPESS2-2. Analyzing and Interpreting Data - Analyze and interpret data to make sense of phenomena using logical reasoning. 4-SEPESS2-2

B. Plate Tectonics and Large-Scale System Interactions - The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features of Earth. 4-DCI.ESS2.B

ESS2-2. Patterns - Patterns can be used as evidence to support an explanation. 4-CC.ESS2-2

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. 4-ESS3-1

4-SEPESS3-1. Obtaining, Evaluating, and Communicating Information - Obtain and combine information from books and other reliable media to explain

phenomena or solutions to a design problem. 4-SEPESS3-1

A. Natural Resources - Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. 4-DCI.ESS3.A

ESS3-1. Cause and Effect - Cause-and-effect relationships are routinely identified and used to explain change. 4-CC.ESS3-1

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. 4-ESS3-2

4-SEPESS3-2. Constructing Explanations and Designing Solutions - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. 4-SEPESS3-2

B. Natural Hazards - A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. 4-DCI.ESS3.B

B. Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs under a range of likely conditions. 4-DCI.ETS1.B

ESS3-2-1. Cause and Effect - Cause-and-effect relationships are routinely identified, tested, and used to explain change. 4-CC.ESS3-2-1

3-5 Engineering Design

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 3-5-ETS1-1

3-5-SEPEST1-1. Asking Questions and Defining Problems - Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. 3-5-SEPEST1-1

1A. Defining and Delimiting Engineering Problems - Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. 3-5-DCI.ETS1.1A

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. 3-5-ETS1-2

3-5-SEPEST1-2. Constructing Explanations and Designing Solutions - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. 3-5-SEPEST1-2

2B. **Developing Possible Solutions - Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.** `3-5-DCI.ETS1.2B`

3-5-ETS1-3. **Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.** `3-5-ETS1-3`

3-5-SEPEST1-3. **Planning and Carrying Out Investigations - Plan and conduct an investigation collaboratively in order to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered.** `3-5-SEPEST1-3`