South Dakota Science

Middle School Science (Grades 6-8)

Physical Science PS

1 Matter and Its Interactions PS1

1 Develop models to describe the atomic composition of simple molecules and extended structures. (SEP:2; DCI: PS1.A; CCC: Scale/Prop.) MS-PS1-1

2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. (SEP: 8; DCI: PS1.A, PS1.B; CCC: Patterns) MS-PS1-2

3 Obtain and evaluate information to describe that synthetic materials come from natural resources and impact society. (SEP: 8; DCI: PS1.A, PS1.B; CCC: Structure/Function) MS-PS1-3

4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. (SEP:2; DCI: PS1.A, PS3.A; CCC: Cause/Effect) MS-PS1-4

5 Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. (SEP: 2; DCI: PS1.B; CCC: Energy/Matter) MS-PS1-5

6 Design, construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. (SEP: 6; DCI: PS1.B, ETS1.B, ETS1.C; CCC: Energy/Matter) Alignment may include MS-ETS1-2; MS-ETS1-3; MS-ETS1-4 MS-PS1-6

Skip to main content

2 **Motion and Stability: Forces and Interactions** PS2

1. Design a solution to a problem involving the motion of two colliding objects that illustrates Newton's Third Law. (SEP: 6; DCI: PS2.A, ETS1.B; CCC: Systems) Alignment may include MS-ETS1-1 MS-PS2-1
2. Plan 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. (SEP: 3; DCI: PS2.A; CCC: Stability/Change) MS-PS2-2
3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (SEP: 1; DCI: PS2.B; CCC: Cause/Effect) MS-PS2-3
4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (SEP:7; DCI: PS2.B; CCC: Systems) MS-PS2-4
5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other when objects are not in contact. (SEP:3; DCI: PS2.B; CCC: Cause/Effect) MS-PS2-5

3 **Energy** PS3

1. Construct and analyze graphical displays of data to describe the relationships of kinetic energy to the mass and to the speed of an object. (SEP:4; DCI: PS3.A; CCC: Scale/Prop.) MS-PS3-1
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. (SEP:2; DCI: PS3.A, PS3.C; CCC: Systems) MS-PS3-2
3. Design, construct, and test a device that either minimizes or maximizes thermal energy transfer. (SEP: 6; DCI: PS3.A, PS3.B, ETS1.A, ETS1.B; CCC: Energy/Matter) May include alignment to MS-ETS1-1 and MS-ETS1-2 MS-PS3-3
4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (SEP:3; DCI: PS3.A, PS3.B; CCC: Scale/Prop.) MS-PS3-4
5. Engage in argument from evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. (SEP: 7; DCI: PS3.B; CCC: Energy/Matter) MS-PS3-5

4 **Waves and Their Applications in Technologies for Information Transfer** PS4

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. (SEP: 5; DCI: PS4.A; CCC: Patterns) MS-PS4-1
2. Develop and use a model to describe how waves are reflected, absorbed, or transmitted through various materials. (SEP:2; DCI: PS4.A, PS4.B; CCC: Structure and Function) MS-PS4-2

Skip to main content

3 Obtain, evaluate and communicate information to support an evidence-based claim for the reliability of digitized signals to encode and transmit information compared to analog signals. (SEP: 8; DCI: PS4.C; CCC: Structure and Function) MS-PS4-3

Life Science LS

1 From Molecules to Organisms: Structures and Processes LS1

1 Plan and carry out an investigation to provide evidence that living things are made of cells; either one cell or many different types and numbers of cells. (SEP: 3; DCI: LS1.A; CCC: Scale/Prop) MS-LS1-1

2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. (SEP: 2; DCI: LS1.A; CCC: Structure/Function) MS-LS1-2

3 Construct an evidence-based argument for how the body is a system of interacting subsystems composed of groups of cells, tissues, and organs. (SEP: 7; DCI: LS1.A; CCC: Systems) MS-LS1-3

4 Construct an evidence-based argument to support an explanation for a) how characteristic animal behaviors affect the probability of successful reproduction of animals; and b) how specialized structures affect the probability of successful reproduction of plants. (SEP: 7; DCI: LS1.B; CCC: Cause/Effect) MS-LS1-4

5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (SEP: 6; DCI: LS1.B; CCC: Cause/Effect) MS-LS1-5

6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. (SEP: 6, Nature Science/Empirical Evidence; DCI: LS1.C, PS3.D; CCC: Energy/Matter) MS-LS1-6

7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. (SEP: 2; DCI: LS1.C, PS3.D; CCC: Energy/Matter) MS-LS1-7

2 Ecosystems: Interactions, Energy, and Dynamics LS2

1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (SEP: 4; DCI: LS2.A; CCC: Cause/Effect) MS-LS2-1

2 Construct an explanation that predicts patterns (relationships) of interactions among organisms across multiple ecosystems. (SEP: 6; DCI: LS2.A; CCC: Patterns) MS-LS2-2

3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (SEP: 2; DCI: LS2.B; CCC: Energy/Matter) MS-LS2-3

4 Construct an evidence-based argument that articulates how changes to physical or biological components of an ecosystem affect populations. (SEP: 7; DCI: LS2.C; CCC: Stability/Change) MS-LS2-4

Skip to main content

5 Evaluate competing design solutions for maintaining biodiversity and ecosystem preservation practices and services. (SEP: 7; DCI: LS2.C, LS4.D, ETS1.B; CCC: Stability/Change) Alignment may include MS-ETS1-2 MS-LS2-5

3 Heredity: Inheritance and Variation of Traits LS3

1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. (SEP:2; DCI: LS3.A, LS3.B; CCC: Structure/Function) MS-LS3-1

2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. (SEP: 2; DCI: LS1.B, LS3.A, LS3.B; CCC: Cause/Effect) MS-LS3-2

4 Biological Unity and Diversity LS4

1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth. (SEP: 4; DCI: LS4.A; CCC: Patterns) MS-LS4-1

2 Apply scientific ideas to construct an explanation for similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. (SEP: 6; DCI: LS4.A; CCC: Patterns) MS-LS4-2

4 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. (SEP: 6; DCI: LS4.B; CCC: Cause/Effect) MS-LS4-4

5 Obtain, evaluate, and communicate information about how technological advances have changed the way humans influence the inheritance of desired traits in organisms. (SEP: 8; DCI: LS4.B, CCC: Cause/Effect) Alignment may include MS-ETS1-1, MS-ETS1-4 MS-LS4-5

6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. (SEP: 5; DCI: LS4.C; CCC: Cause/Effect) MS-LS4-6

Earth and Space Science ESS

1 Earth's Place in the Universe ESS1

1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. (SEP: 2; DCI: ESS1.A, ESS1.B; CCC: Patterns) MS-ESS1-1

2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. (SEP: 2; DCI: ESS1.A, ESS1.B; CCC: Systems) MS-ESS1-2

3 Analyze and interpret data to determine scale properties of objects in the solar system. (SEP: 4; DCI: ESS1.B; CCC: Scale/Prop.) MS-ESS1-3

4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. (SEP:6; DCI: ESS1.C; CCC: Scale/Prop.) MS-ESS1-4

Skip to main content

2 Earth's Systems ESS2

1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. (SEP: 2; DCI: ESS2.A; CCC: Stability/Change) MS-ESS2-1
2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. (SEP: 6; DCI: ESS2.A, ESS2.C; CCC: Scale/Prop.) MS-ESS2-2
3. Analyze and interpret data on the age of the Earth, distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. (SEP: 4; DCI: ESS2.B, ESS1.C; CCC: Patterns) MS-ESS2-3
4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (SEP: 2; DCI: ESS2.C; CCC: Energy/Matter) MS-ESS2-4
5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. (SEP: 3; DCI: ESS2.C, ESS2.D; CCC: Cause/Effect) MS-ESS2-5
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. (SEP: 2; DCI: ESS2.C, ESS2.D; CCC: Systems) MS-ESS2-6

3 Earth and Human Activity ESS3

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. (SEP: 6; DCI: ESS3.A; CCC: Cause/Effect) MS-ESS3-1
2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. (SEP: 4; DCI: ESS3.B; CCC: Patterns) MS-ESS3-2
3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. (SEP: 6; DCI: ESS3.C, ETS1.B; CCC: Cause/Effect) Alignment may include MS-ETS1-1 MS-ESS3-3
4. Construct an argument supported by evidence for how increases in human population and per- capita consumption of natural resources impact Earth's systems. (SEP: 7; DCI: ESS3.C; CCC: Cause/Effect, Nature Science/Consequence-Actions) MS-ESS3-4
5. Ask questions to clarify evidence of the factors that may have caused a change in global temperatures over the past century. (SEP: 1; DCI: ESS3.D; CCC: Stability/Change) MS-ESS3-5

Engineering, Technology, and Applications of Sci

Skip to main content

1 Engineering Design ETS1

1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, considering relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. Alignment may include MS-PS2-1; MS-PS3-3; MS-LS4-5 MS-ETS1-1

2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. Alignment may include 6-8-PS1-6; MS-PS3-3; MS-LS2-5; MS-ESS3-3 MS-ETS1-2

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. Alignment may include MS-PS1-6 MS-ETS1-3

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. Alignment may include MS-PS1-6; MS-LS4-5 MS-ETS1-4