**SOUTH DAKOTA ALTERNATE ASSESSMENT FOR SCIENCE – Core Content Connectors (CCC) –**

**POLICY ACHIEVEMENT LEVEL DESCRIPTORS**

**Exceeded:** A student who is Exceeded demonstrates a level of understanding that includes the ability to “bring together” the Disciplinary Core Ideas (DCI) and/or Science and Engineering Practices (SEP) and/or Crosscutting Concepts (CCC) associated with a PE.

**Met:** A student who is Met demonstrates an understanding of the Disciplinary Core Ideas (DCI) and/or Science and Engineering Practices (SEP) and/or Crosscutting Concepts (CCC) within the PE at the conceptual level described in the Core Content Connectors.

**Nearly Met:** A student who is Nearly Met demonstrates some understanding of the content of the PE, but that understanding is incomplete and does not yet meet the expectations found in the Core Content Connectors. This student’s understanding is partial but emerging.

**Not Met** A student who is Not Met demonstrates a level of understanding that is at a very preliminary level. This student’s understanding is nonexistent or incomplete, and he or she has diﬃculty meeting the expectations.

**MIDDLE SCHOOL (Administered in Grade 8)**

SD Alternate Science – CCC Middle School

|  |  | **Policy Achievement Level Descriptors** |
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|  |  | **Not Met** | **Nearly Met** | **Met** | **Exceeded** |
|  |  | A student who is Not Met demonstrates a level of understanding that is at a very preliminary level. This student’s understanding is nonexistent or incomplete, and he or she has diﬃculty meeting the expectations. | A student who is Nearly Met demonstrates some understanding of the content of the PE, but that understanding is incomplete and does not yet meet the expectations found in the Core Content Connectors. This student’s understanding is partial but emerging. | A student who is Met demonstrates an understanding of the Disciplinary Core Ideas (DCI) and/or Science and Engineering Practices (SEP) and/or Crosscutting Concepts (CCC) within the PE at the conceptual level described in the Core Content Connectors. | A student who is Exceeded demonstrates a level of understanding that includes the ability to “bring together” the Disciplinary Core Ideas (DCI) and/or Science and Engineering Practices (SEP) and/or Crosscutting Concepts (CCC) associated with a PE. |
| **South Dakota Science Standards** | **DCI Core Content Connectors** | **Range Achievement Level Descriptors** |
| **Code** | **PE** | **Not Met** | **Nearly Met** | **Met** | **Exceeded** |
| **MS-PS1-1** | Develop models to describe the atomic composition of simple molecules and extended structures. | Identify a model that shows an atom’s nucleus as made of protons and neutrons, and is surrounded by electrons.Identify a model that shows individual atoms of the same or different types that repeat to form extended structures (e.g., sodium chloride). | Explore model of atom. | Identify nucleus and electrons in atom model. | Identify protons and neutrons in nucleus, and surrounding electrons. | Compare models of different atoms and explain how they differ. |
| **MS-PS1-2** | Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. | Identify evidence that proves a chemical reaction has taken place (e.g., change in color occurs, gas is created, heat or light is given off or taken in). | Respond to changes in a piece of bread before and after toasting. | Recognize a change in color can be a chemical change. | Identify evidence of a chemical reaction. | Demonstrate different signs of a chemical reaction. |
| **MS-PS1-3** | Obtain and evaluate information to describe that synthetic materials come from natural resources and impact society. | Compare and contrast characteristics of natural and synthetic materials (e.g., fibers) from provided information (e.g., text, media, visual displays, data). | Identify common natural resources. | Identify examples of materials that are made from natural resources (e.g., iron ore into steel, wood into furniture). | Gather information to identify the natural resources used to make a synthetic product (e.g., petroleum into plastics, aluminum into cans). | Using information from a passage, describe the impact on society of making a synthetic material from natural resources (e.g., use of plastics). |
| **MS-PS1-4** | 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. | Identify that adding or removing thermal energy increases or decreases particle motion until a change of state occurs using drawings or diagrams. | Identify matter as a solid, liquid, or gas. | Recognize that a source of heat or cooling can change the state of common materials (e.g., ice melts, water freezes). | Use a model to identify that the particles that make up an object move fast or slowly, depending on the temperature of the object. | Predict the change in particle motion and state of matter that will occur when heat is introduced or removed (e.g., use common occurrences including such things as chocolate getting softer). |
| **MS-PS1-5** | 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. | Identify a chemical reaction in which the mass of the reactants is shown to be equal to the mass of the products.Identify a chemical reaction in which the total number of atoms does not change. | Identify molecules. | Identify molecules reactants and products in a simple chemical reaction. | Recognize that the mass of reactants is equal to the mass of products. | Predict the number of molecules in a product based on the number of molecules in the reactant. |
| **MS-PS1-6** | Design, construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. | Identify a chemical process that releases or absorbs thermal energy (e.g., dissolving ammonium chloride or calcium chloride) which, given the features of a problem, may provide a solution. | Identify properties that show that a chemical reaction has created a new substance. | Identify that a temperature change indicates that a chemical reaction has occurred when two substances have been mixed. | Use presented evidence to determine if a reaction has released or absorbed thermal energy. | Use data to determine if a proposed solution would solve a problem (e.g., use common objects, like chemical reactions that produce temperature changes in heat packs; chemical reactions that are used in ice packs). |
| **MS-PS2-1** | Design a solution to a problem involving the motion of two colliding objects that illustrates Newton’s Third Law. | Describe the motion of two colliding objects in terms of the strength of the force relationship of action and reaction forces given a model or scenario.Develop a solution to a problem involving the motion of two colliding objects. | Identify a collision. | Recognize forces involved in a collision. | Relate the speed of a moving object to the impact of a collision with a stationary object (e.g., toy cars hitting a wall). | Conduct an investigation (simulation or simple data sets provided) to determine how the changing speed of objects affects the motion of the objects when they collide. |
| **MS-PS2-2** | 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. | Recognize, using provided data, that a change in an object’s motion is due to the mass of an object and the forces acting on that object. | Identify that a force (push/pull) is needed to change an object’s motion. | Identify that an object changed position due to an outside factor (e.g., a bowling ball hits a pin and the pin moves). | Predict how the motion of objects with different masses will change when acted on by forces. | Use data from an investigation where two objects with different masses are acted on by a series of forces to support a conclusion. |
| **MS-PS2-3** | Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. | Identify that electricity can be used to make magnetism, or magnetism can be used to make electricity.Examine data of objects (e.g., a model that demonstrates that a piece of metal, when magnetized by electricity, can pick up many times its own weight) to identify cause and effect relationships that affect electromagnetic forces. | Identify a magnet as something that exerts an attractive force on some materials. | Test and sort objects based on whether they are attracted by a magnet. | Use data to make statements about the effect of distance on the interactions between magnets. | Identify a question that could be answered by a scientific investigation involving one or more magnets. |
| **MS-PS2-4** | Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. | Compare the magnitude of gravitational force on interacting objects of different mass (e.g., the Earth and the sun) using a chart displaying the mass of those objects and the strength of interaction. | Observe falling objects. | Recognize that the rate of gravity is the same for all objects. | Recognize that gravity exerts a greater force on massive objects (e.g., Earth and sun). | Compare magnitude of gravitational force on objects of different mass. |
| **MS-PS2-5** | Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. | Evaluate the change in the strength of a force (i.e., electric and magnetic) using data regarding the cause of a force on one object mapped by its effect on a test object. | Identify there are different “poles” of a magnet. | Recognize that like poles repel each other and unlike poles attract. | Relate the orientation of magnets and the distance between them to the behavior of the magnets. | Explain the effect of changing the orientation of one magnet on the behavior of two magnets or changing the distance between two magnets in an experiment. |
| **MS-PS3-1** | Construct and analyze graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. | Describe the relationship of kinetic energy to the mass of an object and to the speed of an object by interpreting graphical displays of data. | Identify an object that is in motion. | Identify the object with the greatest mass and/or fastest speed. | Use mass and speed data to determine the object with the greatest kinetic energy. | Use graphical data to explain that kinetic energy changes as mass or speed increases (e.g., two objects with different masses moving at the same speed or two objects with the same mass moving at different speeds, or a single object whose speed changes). |
| **MS-PS3-2** | 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. | Describe, using models, how changing distance changes the amount of potential energy stored in the system (e.g., carts at varying positions on a hill). | Define potential energy. | Recognize that two objects have different potential energy if at different positions. | Identify differing amounts of potential energy on a labeled diagram (e.g., identify specific points on a motion diagram where potential energy is increasing or decreasing). | Order a group of objects from least to greatest amount of potential energy (e.g., skateboard on a hill, a book held above your head, etc.). |
| **MS-PS3-3** | Design, construct, and test a device that either minimizes or maximizes thermal energy transfer. | Use information (e.g., graph, model) to identify a device (e.g., foam cup, insulated box) that either minimizes or maximizes thermal energy transfer (e.g., keeping liquids hot or cold). | Use an object to minimize thermal (temperature) transfer. | Identify different objects that can prevent thermal (temperature) transfer. | Recognize objects that can maximize or minimize thermal (temperature) transfer. | Demonstrate that thermal (temperature) energy is transferred from hotter to colder objects. |
| **MS-PS3-4** | 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. | Describe the relationship between different masses of the same substance and the change in average kinetic energy when thermal energy is added to or removed from the system using examples and data measurements. | Identify sources of heat. | Identify an object that has changed in temperature due to the application of heat. | Use temperature data to determine the changes of objects of the same material but different masses when heat is applied for a certain period of time. | Draw conclusions using data from an experiment involving adding two cold objects (e.g., ice) of different masses to separate pails of hot water and recording the temperature change of the water over time. |
| **MS-PS3-5** | 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. | Describe the change in the kinetic energy of an object as energy transferred to or from an object using information from graphical displays of data and models. | Observe transfer of kinetic (motion) energy. | Recognize kinetic (motion) energy. | Identify the transfer of kinetic (motion) energy in a model. | Demonstrate the transfer of kinetic (motion) energy. |
| **MS-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. | Identify qualitatively how the amplitude of a wave is related to the energy in a wave using a mathematical or graphical representation. | Identify a wave. | Locate the parts of a wave. | Identify how amplitude is a measure of energy in the wave. | Identify qualitatively how amplitude is related to energy in a wave. |
| **MS-PS4-2** | Develop and use a model to describe how waves are reflected, absorbed, or transmitted through various materials. | Describe, using a model, how sound waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, glass).Describe, using a model, how light waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, glass). | Identify light transfer. | Identify materials that transfer light. | Identify materials that absorb or reflect light. | Demonstrate how light waves travel through various media. |
| **MS-PS4-3** | Obtain, evaluate and communicate information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. | Identify features of waves that make them useful.Determine if the claim that digitized signals are a more reliable way to encode and transmit information than analog signals is supported by evidence using data or qualitative information (i.e., scientific and technical). | Identify different means of communicating. | Describe a method of using technology to communicate. | Identify advantages or disadvantages of various means of communication. | Use data to explain why one means of communication may be better than another. |
| **MS-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. | Identify that living things may be made of one cell or many and varied cells. | Identify living things. | Recognize that the cell is the smallest unit that can be said to be alive. | Use evidence to show that all living things are made up of one or more cells, which are the smallest units that can be said to be alive. | Use evidence to describe how many organisms have many different types of cells (e.g., skin cells, blood cells, muscle cells, brain cells). |
| **MS-LS1-2** | Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. | Identify the function of a cell as a whole.Recognize that special structures within cells are responsible for particular functions. Identify components of a cell.Identify the functions of the components of a cell. | Explore cells. | Identify parts of a cell in a model. | Identify function of cell components. | Explain how parts of a cell work together to support life. |
| **MS-LS1-3** | Construct an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. | Recognize that the body is a system of multiple interacting subsystems.Identify the basic functions of major organ systems (i.e., circulatory, excretory, digestive, respiratory, muscular, or nervous systems).Identify the levels of organization for structure and function which includes cells, tissues, organs, organ systems, and organisms using models or diagrams. | Explore organ systems. | Identify levels of organization from cell to systems. | Identify major organ systems (e.g., circulatory, excretory, digestive, respiratory, etc.). | Explain how the body is made of multiple interacting subsystems. |
| **MS-LS1-4** | Construct an argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. | Identify behaviors animals engage in (e.g., vocalization) and specialized plant structures (e.g., bright flower parts) that increase the likelihood of reproduction. | Identify animal behaviors that contribute to their survival. | Match plant structural adaptations to survival needs. | Use observations to match structural adaptations to survival needs of plants in an environment. | Use given information on animal behaviors that affect plant reproduction to identify the behavior that assists plants. |
| **MS-LS1-5** | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. | Identify a scientific explanation for how environmental factors (e.g., availability of light, space, water, size of habitat) affect the growth of animals and plants.Identify a scientific explanation for how genetic factors (e.g., specific breeds of plants and animals and their typical sizes) affect the growth of animals and plants. | Recognize environmental factors that affect growth. | Identify environmental factors that affect growth. | Identify environmental and/or genetic factors that affect growth. | Explain how environmental and/or genetic factors affect growth. |
| **MS-LS1-6** | 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. | Recognize, using a model of photosynthesis, the movement of matter and flow of energy as plants use the energy from light to make sugars. | Recognize energy conversion in plants (e.g., photosynthesis). | Identify plant structures involved in energy transfer. | Use a model to identify flow of energy as plants use energy from light to make sugars. | Demonstrate the flow of energy and matter as plants use energy from light to make sugars. |
| **MS-LS1-7** | 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. | Identify the outcome of the process of breaking down food molecules (e.g., sugar) as the release of energy, which can be used to support other processes within the organism. | Recognize energy conversion in animals (e.g., cellular respiration). | Identify common structures to release energy from food in organisms. | Use a model to identify flow of energy as animals release energy from food. | Identify the process of breaking down food molecules to release energy that can support other processes within an organism. |
| **MS-LS2-1** | Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. | Recognize that growth of organisms and population increases are limited by access to resources. Identify factors (e.g., resources, climate or competition) in an ecosystem that influence growth in populations of organisms. | Identify an organism and its environmental factor (e.g., duck and pond; a plant and rainfall). | Identify factors that can impact the survival of a population (e.g., presence of a predator or lack of rainfall). | Use data as evidence to show whether a population increases or decreases as a result of a change in the availability of resources in the ecosystem. | Describe how the availability of resources in a habitat changes when a population changes. (e.g., more food, increased competition). |
| **MS-LS2-2** | Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. | Use models of interactions between organisms in an ecosystem to identify examples of competitive, predatory, or symbiotic relationships. | Identify what it means for an organism to interact with its environment (e.g., eating other organisms, drinking water, eating plants, using plants for shelter, using the sun’s warmth). | Identify an interaction between two organisms within an ecosystem (e.g., frogs and lily pads in a pond). | Describe interactions among organisms across multiple ecosystems (e.g., how a predatory, land-based animal interacts with prey in water ecosystems). | Describe patterns of interactions, including those which are predatory, competitive, and mutually beneficial (e.g., cheetahs and lions eating the same food in a habitat). |
| **MS-LS2-3** | Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. | Describe energy transfer between producers and consumers in an ecosystem using a model (e.g., producers provide energy for consumers).Describe the cycling of matter among living and nonliving parts of a defined system (e.g., the atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem). | Recognize parts of an ecosystem. | Identify factors that influence growth of an ecosystem. | Describe energy transfer between organisms in an ecosystem. | Describe cycling of energy and matter among living and nonliving parts of an ecosystem. |
| **MS-LS2-4** | Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. | Identify the outcome of changes in physical or biological components of an ecosystem to populations of organisms in that ecosystem. | Identify the biological and physical components in an ecosystem. | Identify the biological or physical changes (e.g., fire, flood) in an environment that can occur in an ecosystem. | Use data to determine the effect on a population when a supply is limited due to environmental conditions. | Predict what would happen to the populations in an ecosystem when conditions change (e.g., a new species is introduced, a predator is removed, or there is a physical change in the environment like drought conditions). |
| **MS-LS2-5** | Evaluate competing design solutions for maintaining biodiversity and ecosystem services. | Recognize the stability of an ecosystem’s biodiversity is the foundation of a healthy, functioning ecosystem. | N/A | N/A | N/A | N/A |
| **MS-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. | Explain how genetic variations in specific traits may occur as organisms pass on their genetic material from one generation to the next, along with small changes. | Identify a physical mutation (e.g., plant [feature] mutation). | Identify a gene and the location of a gene. | Describe that changes to gene structures can cause new traits that may be helpful or harmful. | Given a scenario, explain that any variation in the structure and function of an organism is the result of a genetic mutation. |
| **MS-LS3-2** | 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. | Identify that a variety of inherited traits passed from parents to offspring lead to differences in offspring (e.g., eye color). | Identify that all living organisms reproduce. | Differentiate between asexual and sexual reproduction. | Use a model to describe why asexual reproduction differs from sexual reproduction. | Use data to show why sexual reproduction leads to trait variation among offspring. |
| **MS-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. | Recognize that fossils of different animals that lived at different times are placed in chronological order (i.e., fossil record) and located in different sedimentary layers. | Identify a fossil. | Identify the relative age of fossils based upon their location in rock layers (e.g., fossils found in a rock layer below another rock layer are older). | Match a fossil to a similar living organism. | Use patterns in fossil data or pictorial information to explain how an organism changed over time (e.g., wooly mammoth and modern elephant). |
| **MS-LS4-2** | Apply scientific ideas to construct an explanation for similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. | Recognize that similarities and differences in external structures can be used to infer evolutionary relationships between living and fossil organisms. | Match pictures of young organisms with parents. | Recognize similarities in pictures of organisms with a common ancestor. | Recognize similarities and differences in pictures of organisms with common ancestors. | Describe how organisms with a common ancestor change over time as they adapt to their environments. |
| **MS-LS4-4** | 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. | Identify a similarity in an external feature (e.g., shape of ears on animals or shape of leaves on plants) between young plants and animals and their parents.Describe the relationship between genetic variation and the success of organisms in a specific environment (e.g., individual organisms that have genetic variations and traits that are disadvantageous in a particular environment will be less likely to survive, and those traits will decrease from generation to generation due to natural selection). | Identify an inherited trait. | Identify a trait that helps individuals survive and reproduce in a specific environment (e.g., speed, strength, size). | Describe a trait in a population that would help organisms survive in a specific environment (e.g., wolf surviving in Yellowstone Park better than in a desert environment). | Explain how some traits help an organism in a population to survive and reproduce in a specific environment (e.g., a fast rabbit compared to a slow rabbit). |
| **MS-LS4-5** | Obtain, evaluate, and communicate information about how technological advances have changed the way humans influence the inheritance of desired traits in organisms. | Identify technologies (e.g., artificial selection for breeding of certain plants and animals) that have changed the way humans influence the inheritance of desired traits in plants and animals. | Identify that traits are inherited from the organism’s parent. | Identify the undesired and desired traits of an organism (e.g., size, taste, color). | Use information to describe selective breeding as a process that allows the best traits to be chosen. | Analyze information (data table, graph, images, etc.) to determine how a desired trait was acquired. |
| **MS-LS4-6** | Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. | Analyze numerical data sets that represent a proportional relationship between some change in the environment and corresponding changes in genetic variation (i.e., traits) over time. | Identify the traits of an animal or plant. | Identify the differences in traits among members of the same animal or plant species (e.g., black, white, and gray mice). | Given a description of an environment, identify the animals or plants within a species that are most likely to survive. | Given a description of an environment, predict future population based on the survival of organisms with favorable traits (e.g., faster predators or camouflaged prey). |
| **MS-ESS1-1** | Develop and use a model of Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. | Use an Earth-sun-moon model to show that the Earth-moon system orbits the sun once an Earth year and the orbit of the moon around Earth corresponds to a month.Use an Earth-sun-moon model to explain eclipses of the sun and the moon.Use an Earth-sun-moon model to explain how variations in the amount of the sun’s energy hitting Earth’s surface results in seasons. | Recognize a model of Earth orbiting the sun and the moon orbiting Earth. | Identify that the moon orbits Earth, and Earth orbits the sun. | Use a model of Earth-sun-moon to visualize solar and lunar eclipses. | Describe why we have solar and lunar eclipses. |
| **MS-ESS1-2** | Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. | Use a model to identify the solar system as one of many systems orbiting the center of the larger system of the Milky Way galaxy, which is one of many galaxy systems in the universe.Use a model to describe the relationships and interactions between components of the solar system as a collection of many varied objects held together by gravity. | Recognize the concept of planets and recognize the concept of gravity. | State the solar system is made up of planets and recognize that gravity holds together the solar system. | Identify the solar system is one of many systems in the Milky Way galaxy and recognize interplanetary (e.g., between planets and planets/moon) relationships as influenced by gravity. | Describe that the solar system is one of many systems in the Milky Way, which is one of many galaxy systems in the universe and recognize the relationships and interactions between components of the solar system as a collection of many varied objects held together by gravity. |
| **MS-ESS1-3** | Analyze and interpret data to determine scale properties of objects in the solar system. | Determine similarities and differences among solar system objects using data (e.g., statistical information, drawings and photographs, and models). | Recognize different objects in the solar system. | Identify different planets in the solar system using pictures. | Identify planets, meteors, asteroids, and comets in pictures. | Use data to describe the characteristics of planets, meteors, asteroids, and comets in pictures based on their features. |
| **MS-ESS2-1** | Develop a model to describe the cycling of earth materials and the flow of energy that drives this process. | Identify relationships between components in a model showing the cycling of energy flows and matter within and among Earth’s systems, including the sun and Earth’s interior as primary energy sources. | Identify earth materials (e.g., water, rocks, minerals, soils). | Identify the rock cycle and different type of rocks (sedimentary, igneous, metamorphic). Identify stages in the water cycle. | Describe how heat from Earth’s core powers the rock cycle.Describe how heat from the sun powers the water cycle. | Use models to describe the importance of the heat from Earth’s core or the sun’s energy to drive Earth processes. |
| **MS-ESS2-2** | Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales. | Identify examples of processes that change Earth’s surface at varying time and spatial scales that can be large (e.g., plate motions) or small (e.g., landslides). | Identify that Earth’s surface features change over time. | Classify processes as slow or fast (e.g., erosion and weathering; landslides and earthquakes). | Recognize that surface processes such as erosion, movement, weathering, and the deposition of sediment can modify surface features, such as mountains, or create new features, such as canyons. | Given a scenario, describe which process (weathering, erosion, deposition) contributed to the change of Earth’s surface. |
| **MS-ESS2-3** | Analyze and interpret data on the age of Earth, distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. | Identify how the shapes of the continents (e.g., fit like a jigsaw puzzle) and fossil comparisons (e.g., fit together) along the edges of continents to demonstrate lithospheric plate movement. | Explore the different plates of Earth. | Recognize Earth's crust is made up of plates. | Recognize the major tectonic plates. | Describe how plate tectonics have changed Earth over time. |
| **MS-ESS2-4** | Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity. | Identify components in a model of water cycling among land, ocean, and atmosphere, and recognize how it is propelled by sunlight and gravity. | Identify bodies of water on Earth. | Identify the parts of the water cycle. | Use a model of the water cycle to explain the role of the sun in the water cycle. | Use a model of the water cycle to explain the cycling of water through Earth’s systems. |
| **MS-ESS2-5** | Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. | Identify how water influences weather and weather patterns through atmospheric, land, and oceanic circulation. | Observe different weather conditions. | Indicate current weather conditions. | Label factors that create weather. | List factors that create weather. |
| **MS-ESS2-6** | Develop and use a model to describe how unequal heating and rotation of Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. | Recognize that as the sun’s energy warms the air over the land (expands and rises), the air over the ocean (cooler air) rushes in to take its place and is called wind (sea breeze).Recognize that weather and climate vary with latitude, altitude, and regional geography. | Identify a feature of a climate. | Match a climate to an area or region. | Describe how climate is determined in an area based on location, shape of land, and distance from water. | Use models to explain how climate is determined in an area (e.g., latitude, elevation, shape of land, distance from water). |
| **MS-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. | Identify explanations of the uneven distributions of Earth’s minerals, energy, and groundwater resources due to past and current geoscience processes or by removal of resources. | Identify a natural resource. | Identify the physical locations (on top of crust or within layers of Earth) of natural resources used in daily life (e.g., water, food, metals, oil). | Use data to explain why specific resources are limited. | Describe how the use of nonrenewable resources changes how much of the resources remain for future use. |
| **MS-ESS3-2** | Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. | Use maps, charts, and images of natural hazards to look for patterns in past occurrences of catastrophic events in each of two regions to predict which location may receive a future similar catastrophic event.Identify technologies that mitigate the effects of natural hazards (e.g., the design of buildings and bridges to resist earthquakes, storm shelters for tornados, levees along rivers to prevent flooding). | Recognize natural hazards. | Identify the effects of natural hazards. | Recognize how technology has helped handle natural hazards. | Describe technologies developed to deal with natural hazards by predicting, protecting life and property, or withstanding an event. |
| **MS-ESS3-3** | Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. | Use data from an existing design solution for minimizing a human impact on the environment to identify limitations of the use of technologies employed by the solution. | Identify ways that humans can benefit their local environment. | Identify human actions that can affect Earth. | Match human activities with their effect on Earth. | Describe human activities as positive or negative in terms of their effect on Earth. |
| **MS-ESS3-4** | Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems. | Identify changes that humans have made to Earth’s natural systems using a variety of resources. | Identify the resources people need to survive. | Describe ways in which human activity uses natural resources. | Link population increases to a greater need for consumption of resources. | Using evidence, explain that human consumption of natural resources has both positive and negative consequences. |
| **MS-ESS3-5** | Ask questions to clarify evidence of the factors that may have caused a change in global temperatures over the past century. | Identify evidence of the effects of human activities on changes in global temperatures over the past century using a variety of resources (e.g., tables, graphs, and maps of global and regional temperatures; atmospheric levels of gases, such as carbon dioxide and methane; and rates of human activities). | Identify an activity that releases carbon dioxide. | Identify human activities that have an impact on the biosphere. | Use data (numerical, graphical, or pictorial) as evidence of rising temperatures over the last 100 years. | Describe ways in which rising temperatures could impact the biosphere on Earth. |