6.MS-ESS1-1. Analyze and interpret rock layers and index fossils to determine the relative ages of rock formations that result from processes occurring over long periods of time. Clarification Statement: Analysis includes laws of superposition and crosscutting relationships limited to minor displacement faults that offset layers. Processes that occur over long periods of time include changes in rock types through weathering, erosion, heat, and pressure. State Assessment Boundary: Stratigraphic sequences that have been reworked or overturned, names of specific periods or epochs and events within them, or the identification and naming of minerals or rock types are not expected in state assessment.

6.MS-ESS1-4. Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence that Earth's plates have moved great distances, collided, and spread apart. Clarification Statement: Maps may show similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) similar to Wegener's visuals. State Assessment Boundary: Mechanisms for plate motion or paleomagnetic anomalies in oceans and continental crust are not expected in state assessment.

6.MS-LS1-1. Analyze and interpret evidence from the fossil record to describe organisms and their environment, extinctions, and changes to life forms throughout the history of the Earth. Clarification Statement: Examples of evidence include sets of fossils that indicate a specific type of environment, anatomical structures that indicate the function of an organism in the environment, and fossilized tracks that indicate behavior of organisms. State Assessment Boundary: Names of individual species, geological era in the fossil record, or mechanisms for extinction or speciation are not expected in state assessment.

6.MS-LS1-2. Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms. Clarification Statement: Evolutionary relationships include (a) some organisms have similar traits with similar functions because they were inherited from a common ancestor, (b) some organisms have similar traits that serve similar functions because they live in similar environments, and (c) some organisms have traits inherited from common ancestors that no longer serve their original function because their environments are different from their ancestors' environments.

6.MS-LS1-3. Provide evidence that organisms (unicellular and multicellular) are made of cells. Clarification Statement: Evidence can be drawn from multiple types of organisms, such as plants, animals, and bacteria.

6.MS-LS1-4. Develop and use a model to describe how parts of the cell contribute to the cellular functions of obtaining food, water, and other nutrients from its environment, disposing of waste, and providing energy for cellular processes. Clarification Statement: Parts of plant and animal cells include: (a) the nucleus, which contains a cell’s genetic material and regulates its activities; (b) chloroplasts, which produce necessary food (sugar) and oxygen through photosynthesis (in plants); (c) mitochondria, which release energy from food through cellular respiration; (d) vacuoles, which store materials, including water, nutrients, and waste; (e) the cell membrane, which is a selective barrier that enables nutrients to enter the cell and wastes to be expelled; and (f) the cell wall, which provides structural support (in plants). State Assessment Boundary: Specific biochemical steps or chemical processes, the role of ATP, active transport processes involving the cell membrane, or identifying or comparing different types of cells are not expected in state assessment.

6.MS-PS1-3. Plan and conduct an experiment using exothermic and endothermic reactions to measure and describe the release or absorption of thermal energy released. Clarification Statement: Emphasis is on describing transfer of energy into and from the environment. Examples of chemical reactions could include dissolving ammonium chloride or calcium chloride.

6.MS-PS1-7(IA). Use a particulate model of matter to explain diffusion and osmosis.
7.MS-LS1-4. Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants.

Clarification Statements: Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalizations and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds and creating conditions for seed germination and growth. Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar, and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. State Assessment Boundary:
Each Year ~ 180 days; Each Quarter ~ 45 days
1 unit/Q ~ 45 days, 9 weeks
2 units/Q ~ 22 days, 4.5 weeks
3 units/Q ~ 15 days, 3 weeks

8. MS-ESS2-1: Use a model to illustrate that energy from the Earth’s interior drives convections 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. Clarification Statement: The emphasis is on large-scale cycling resulting from plate tectonics.

8. MS-ETS2-4 (MA): Use informational text to illustrate that materials maintain their composition under various kinds of physical processing; however, some material properties may change if a process changes the particular structure of a material. Clarification Statement: Examples of physical processing can include cutting, forming, extruding, and sanding. Examples of changes in material properties can include a non-magnetic iron material becoming magnetic after hammering and a plastic material becoming rigid (less elastic) after heat treatment.

8. MS-ETS2-5 (MA): Present information that illustrates how a product can be created using basic processes in manufacturing systems, including forming, separating, conditioning, assembling, finishing, quality control, and safety. Compare the advantages and disadvantages of human vs. computer control of these processes.

8. PS1-1: Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed. Clarification Statements: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of pure substances could include water, carbon dioxide, and helium.

8. PS1-2: Develop a model to describe that (a) atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances. Clarification Statements: Examples of molecular-level models could include drawings, three-dimensional ball and stick structures, and computer representations showing different molecules with different types of atoms. State Assessment Boundary: Valence electrons and bonding energy, the ionic nature of subsets of complex structures, complete depictions of all individual atoms in a complex molecule or extended structure, or calculations of proportions in mixtures are not expected in state assessment.
7.MS-ETS1.2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.

7.MS-LS2-6(MA). Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use. Clarification Statement: Examples of resources can include food, energy, medicine, and clean water.

7.MS-LS2-5. Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design. Clarification Statement: Examples of design solutions could include water, land, and species protection, and the prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.

7.MS-ESS3-4. Construct an argument supported by evidence that human activities and technologies can mitigate the impact of increases in human population and per-capita consumption of natural resources on the environment. Clarification Statement: Arguments should be based on examining historical data such as population graphs, natural resource distribution maps, and water quality studies over time. Examples of negative impacts can include changes to the amount and quality of natural resources such as water, mineral, and energy supplies.

8.MS-ESS1-1b. Develop and use a model of the Earth-Sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and differential intensity of sunlight on different areas of Earth across the year. Clarification Statement: Examples of models can be physical or graphical.

8.MS-PS2-2. Provide evidence that the change in an object’s motion depends on the sum of the forces on the object (the net force) and the mass of the object. Clarification Statement: Emphasis is on balanced (Newton’s First law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton’s Second law) in one dimension. State Assessment Boundaries: State assessment will be limited to forces and changes in motion in one dimension in an inertial reference frame and to change in one variable at a time. The use of trigonometry is not expected in state assessment.

8.MS-ESS1-2. Explain the role of gravity in ocean tides, the orbital motions of planets, their moons, and asteroids in the solar system. State Assessment Boundary: asteroids. Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth are not expected in state assessment.
6.MS-PS4-1. Use diagrams of a simple wave to explain that (a) a wave has a repeating pattern with a specific amplitude, frequency and wavelength, and (b) the amplitude of a wave relates to the energy of a wave. State Assessment Boundary: Electromagnetic waves are not expected in state assessment. State assessment will be limited to standard repeating waves.

6.MS-PS4-2. Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials. Clarification Statements: Materials may include solids, liquids, and gases. Mechanical waves (including sound) need a material (medium) through which they are transmitted. Examples of models could include drawings, simulations, and written descriptions. State Assessment Boundary: State Assessment will be limited to qualitative applications.

6.MS-PS4-3. Present qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses representing 0s and 1s) can be used to encode and transmit information. State Assessment Boundary: Binary counting or the specific mechanism of a given device are not expected in state assessment.

7.MS-ETS3-1(MA). Explain the function of a communication system and the role of its components, including a source, encoder, transmitter, receiver, decoder, and storage.

7.MS-ETS3-2(MA). Compare the benefits and drawbacks of different communication systems. Clarification Statements: Examples of communications systems can include radio, television, print, and Internet. Examples of benefits and drawbacks can include speed of communication, distance or range, number of people reached, audio only vs. audio and visual, and one-way vs. two-way communication.

7.MS-PS3-2. Develop a model to describe the relationship between the relative positions of objects interacting at a distance and their relative potential energy in the system. Clarification Statements: Examples of systems intersecting at varying distances could include Earth and either a roller coaster cart at varying positions on a hill or objects varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a stream of water. Examples of models could include representations, diagrams, pictures, and written descriptions of systems. State Assessment Boundary: State Assessment will be limited to electrical, magnetic, and gravitational interactions and to interactions of two objects at a time. Calculations of potential energy are not expected in state assessment.

7.MS-PS3-5. Use scientific evidence to argue that fields exist between objects with mass, between magnetic objects, and between electrically charged objects that exert force on each other even though the objects are not in contact. Clarification Statement: Emphasis is on evidence that demonstrates the existence of fields, limited to gravitational, electric, and magnetic fields. State Assessment Boundary: Calculations of force are not expected in state assessment.

7.MS-PS2-3. Analyze data to describe the effect of distance and magnitude of electric charge on the strength of electric forces. Clarification Statement: Includes both attractive and repulsive forces. State Assessment Boundary: State Assessment will be limited to proportional reasoning. Calculations using Coulomb’s law or interactions of subatomic particles are not expected in state assessment.
7.MS-PS3-1. Construct and interpret data and graphs to describe the relationships among kinetic energy, mass, and speed of an object. Clarification Statement: Examples could include riding a bicycle at different speeds and rolling different sized rocks downhill. Consider relationships between kinetic energy vs. mass and kinetic energy vs. speed separate from each other; emphasis is on the difference between the linear and exponential relationships. State Assessment Boundary: Calculations or manipulation of the formula for kinetic energy is not expected in state assessment.

7.MS-PS3-5. Present evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Clarification Statement: Examples of empirical evidence could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object. State Assessment Boundary: Calculations of energy are not expected in state assessment.

7.MS-PS3-7(MA). Use informational text to describe the relationship between kinetic and potential energy and describe conversions from one form to another. Clarification Statement: Types of kinetic energy include motion, sound, thermal, and light; types of potential energy include gravitational, elastic, and chemical.
for how environmental and genetic factors influence the growth of organisms. Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include the genes responsible for size differences in different breeds of dogs, such as Great Danes and Chihuahuas. Examples of environmental factors could include drought decreasing plant growth, fertilizer increasing plant growth, and fish growing larger in large ponds than they do in small ponds. Examples of both genetic and environmental factors could include different varieties of plants growing at different rates in different conditions. State Assessment Boundary: Methods of reproduction, genetic mechanisms, gene regulation, biochemical processes, or natural selection are not expected in state assessment.

8.MS-LS-3. Develop and use a model to describe that structural changes to genes (mutations) may or may not result in changes to proteins, and if there are changes to proteins there may be harmful, beneficial, or neutral changes to traits. Clarification Statement: An example of a beneficial change to the organism may be a strain of bacteria becoming resistant to an antibiotic. A harmful change could be the development of cancer; a neutral change may change the hair color of an organism with no direct consequence. State Assessment Boundary: Specific changes at the molecular level (e.g., amino acid sequence change), mechanisms for protein synthesis, or specific types of mutations are not expected in state assessment.

8.MS-LS-3.3D. Communicate through writing in diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of an individual. State Assessment Boundary: Specific changes at the molecular level or mechanisms for protein synthesis are not expected in state assessment.

8.MS-LS-3.4D. Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their cell nuclei, and hence two variants (alleles) of each gene can be the same or different from each other, with one random assortment of each chromosome passed down to offspring from both parents. Clarification Statement: Examples of models can include Punnett squares, diagrams (e.g., simple pedigrees), and simulations. State Assessment Boundary: State assessment will limit patterns to dominant-recessive only.

8.MS-LS-3.2D. Construct an argument based on evidence for how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Compare and contrast advantages and disadvantages of asexual and sexual reproduction. Clarification Statement: Examples of an advantage of sexual reproduction can include genetic variation when the environment changes or a disease is introduced, while examples of an advantage of asexual reproduction can include not using energy to find a mate and fast reproduction rates. Examples of a disadvantage of sexual reproduction can include using resources to find a mate, while a disadvantage in asexual reproduction can be the lack of genetic variation when the environment changes or a disease is introduced.