PROPOSED 2024 WYOMING SCIENCE EXTENDED STANDARDS AND ACHIEVEMENT LEVEL DESCRIPTORS

Grade Kindergarten

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K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. *Clarification Statement:* Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.	**SES-K-PS2-1** Identify the effects of pushes and pulls on the motion of an object.	**Level IV Students will:** Conduct an investigation to compare the effects of different strengths, or different directions, of pushes and pulls on the motion of an object. **Level III Students will**: Identify the effects of pushes and pulls on the motion of an object. **Level II Students will:** Participate in activities that demonstrate how different objects move. **Level I Students will:** Attend to activities that demonstrate how objects move.
K-PS3-2 Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. *Clarification Statement:* Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.	**SES-K-PS3-2** Identify structures that will reduce the warming effect of sunlight.	**Level IV Students will:** Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. **Level III Students will:** Identify structures that will reduce the warming effect of sunlight. **Level II Students will:** Recognize that certain structures reduce the warming effect of sunlight. **Level I Students will:** Attend to activities that demonstrate how structures reduce the warming effect of sunlight.
K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. *Clarification Statement:* Examples of relationships could include that deer eat buds and leaves, therefore, they	**SES-K-ESS3-1** Describe how animals meet their needs based on where they live.	**Level IV Students will:** Demonstrate the relationship between the needs of animals and the places they live. **Level III Students will:** Describe how animals meet their needs based on where they live. **Level II Students will:** Match animals to the place they live **Level I Students will:**

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usually live in forested and rangeland areas; and, grasses need sunlight so they often grow in meadows and prairies. Plants, animals, and their surroundings make up a system.		Attend to activities that demonstrate the relationship between animals and where they live.
K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	**SES-K-2-ETS1-2** Identify the shape of an object and its function.	**Level IV Students will:** Represent how the shape of an object helps it function as needed to solve a given problem. **Level III Students will:** Identify the shape of an object and its function. **Level II Students will:** Match an object with a shape. **Level I Students will:** Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.

Grade 1

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. *Clarification Statement:* Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of	**SES-1-PS4-4** Identify multiple devices that communicate over a distance.	**Level IV Students will:** Create a device that communicates over a distance. **Level III Students will:** Identify multiple devices that communicate over a distance. **Level II Students will:** Identify one device that uses sound to communicate over a distance. **Level I Students will:** Attend to activities that demonstrate how devices communicate over a

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drum beats.		distance.
1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. *Clarification Statement*: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, pine cone scales, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.	**SES-1-LS1-1** Identify an object used by humans that mimics an animal's or a plant's external parts.	**Level IV Students will:** Compare the animal/plant external parts to the human object and how they serve similar purposes. **Level III Students will:** Identify an object used by humans that mimics an animal's or a plant's external parts. **Level II Students will:** Match the animal/plant external part to the human object that serves a similar purpose. **Level I Students will:** Attend to activities that compare an animal's or plant's external parts to human objects that solve problems.
1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted. *Clarification Statement:* Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.	**SES-1-ESS1-1** Identify which objects are found in the sky during the day and at night.	**Level IV Students will:** Demonstrate how the moon, sun and stars can be observed at different times of the day and night. **Level III Students will:** Identify which objects are found in the sky during the day and at night. **Level II Students will:** Distinguish between daytime sky and nighttime sky. **Level I Students will:** Attend to activities that demonstrate how objects found in the sky are different during the day and night.

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K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	**SES-K-2-ETS1-1** Identify appropriate tool(s) when presented with a problem.	**Level IV Students will:** Represent a tool, existing or nonexistent, to solve a given problem. **Level III Students will:** Identify appropriate tool(s) when presented with a problem. **Level II Students will:** Match the tool to the use. **Level I Students will:** Attend to activities that demonstrate tools being used to solve problems.

Grade 2

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. *Clarification Statement:* Examples of properties could include strength, flexibility, hardness, texture, and absorbency.	**SES-2-PS1-2** Determine the material that is best suited for an intended purpose.	**Level IV Students will:** Investigate, and communicate, the properties of a material that makes it best suited for an intended purpose. **Level III Students will:** Determine the material that is best suited for an intended purpose. **Level II Students will:** Sort different materials by their properties. **Level I Students will:** Attend to activities that demonstrate materials being used for their intended purpose.
2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. *Clarification Statement:* Examples could include the natural structure of an animal that helps it disperse	**SES-2-LS2-2** Participate in activities that demonstrate pollination or seeding, and communicate a way that seeds are dispersed.	**Level IV Students will:** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. **Level III Students will:** Participate in activities that demonstrate pollination or seeding, and communicate a way that seeds are dispersed. **Level II Students will:**

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seeds (e.g., hair that snares seeds, squirrel cheek pouches that transport seeds) or that helps it pollinate plants (e.g., bees have fuzzy bodies to which pollen sticks, hummingbirds' bodies transport pollen).		Participate in activities that demonstrate pollination or seeding. **Level I Students will:** Attend to, or participate in, activities that demonstrate pollination or seeding.
2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats. *Clarification Statement:* Emphasis is on the diversity of living things in each of a variety of different habitats.	**SES-2-LS4-1** Make a model of an animal in its habitat.	**Level IV Students will:** Model, and describe, the habitat of an animal. **Level III Students will:** Make a model of an animal in its habitat. **Level II Students will:** Match an animal to its correct habitat. **Level I Students will:** Attend to activities that demonstrate diversity of life in different habitats.
2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. *Clarification Statement:* Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.	**SES-2-ESS2-1** Participate in activities that demonstrate a design made to slow or prevent water from passing, and communicate the changes.	**Level IV Students will:** Develop a simple model that demonstrates a design made to slow or prevent water from passing. **Level III Students will:** Participate in activities that demonstrate a design made to slow or prevent water from passing, and communicate changes **Level II Students will:** Participate in activities that demonstrate a design made to slow or prevent water from passing. **Level I Students will:** Attend to activities that demonstrate a design made to slow or prevent water from passing.
K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and	**SES-K-2-ETS1-3** Identify the differences of two objects designed to solve the same problem.	**Level IV Students will:** Test and compare the differences of two objects designed to solve the same problem. **Level III Students will:**

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weaknesses of how each performs.		Identify the differences of two objects designed to solve the same problem. **Level II Students will:** Match the tool to solve the given problem. **Level I Students will:** Attend to activities that compare two objects designed to solve the same problem.

Grade 3

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
3-PS2-3 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. *Clarification Statement:* Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paper clips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects	**SES-3-PS2-3** Demonstrate the effects of a magnetic, or electric, interaction between two objects not in contact with each other.	**Level IV Students will:** Ask questions based on observations of a magnetic, or electric, interaction between two objects not in contact with each other. **Level III Students will:** Demonstrate the effects of a magnetic, or electric, interaction between two objects not in contact with each other. **Level II Students will:** Explore magnetic, or electric, interactions between two objects not in contact with each other. **Level I Students will:** Attend to the presence of magnetic or electric interactions between two objects not in contact with each other.

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affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.		
3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. *Clarification Statement:* Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.	**SES-3-LS3-1** Use evidence to show how offspring inherit physical traits that resemble those of their parents.	**Level IV Students will:** Provide evidence of specific traits that offspring inherit from their parents and that these traits can vary. **Level III Students will:** Use evidence to show how offspring inherit physical traits that resemble those of their parents. **Level II Students will:** Match offspring that resemble their parents. **Level I Students will:** Attend to teacher matching offspring to parent
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. *Clarification Statement*: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.	**SES-3-LS4-4** Identify what happens to organisms when there is a major environmental change.	**Level IV Students will:** Predict what happens to an organism when there is a major environmental change. **Level III Students will:** Identify what happens to organisms when there is a major environmental change. **Level II Students will:** Identify major environmental changes. **Level I Students will:** Attend to a presentation of pictures of major environmental changes.
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. *Clarification Statement:* Examples of design solutions to weather-related	**SES-3-ESS3-1** Communicate a solution that reduces the impacts of weather.	**Level IV Students will:** Create a solution that reduces the impact of a weather condition upon their environment. **Level III Students will:** Communicate a solution that reduces the impacts of weather. **Level II Students will:**

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hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.		Match a solution that reduces the impact of weather **Level I Students will:** Attend to a presentation of solutions that reduce the impact of weather.
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.	**SES-3-5-ETS1-1** Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials.	**Level IV Students will:** Define a solution for a simple design problem that reflects a need or a want. **Level III Students will:** Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials. **Level II Students will:** Match the appropriate materials for a project given a list of possible materials to complete a simple design problem. **Level I Students will:** Attend to activities that demonstrate finding a solution to a simple design problem.

Grade 4

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. *Clarification Statement*: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater	**SES-4-PS3-4** Identify devices that use different types of energy.	**Level IV Students will:** Create a device that uses energy. **Level III Students will:** Identify devices that use different types of energy **Level II Students will:** Sort objects that require energy and those that do not require energy. **Level I Students will:** Attend to a presentation showing devices that use different types of energy.

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that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.		
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. *Clarification Statement*: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.	**SES-4-PS4-1** Use a model to show what a wave looks like.	**Level IV Students will:** Use a model to demonstrate different wave patterns. **Level III Students will:** Use a model to show what a wave looks like. **Level II Students will:** Identify a wave. **Level I Students will:** Attend to a demonstration of wave movement.
4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information. *Clarification Statement:* Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse Code to send text.	**SES-4-PS4-3** Use a method to send or receive information.	**Level IV Students will:** Generate a signal to transfer information. **Level III Students will:** Use a method to send or receive information. **Level II Students will:** Respond to the signal of transfer of information. **Level I Students will:** Attend to the teacher modeling a transfer of information.
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. *Clarification Statement:* Examples of structures could include thorns, stems, roots, colored petals, heart,	**SES-4-LS1-1** Use a model to demonstrate that plants and animals have structures that support their survival.	**Level IV Students will:** Make a model that demonstrates how a structure functions to help an organism survive. **Level III Students will:** Use a model to demonstrate that plants and animals have structures that support their survival. **Level II Students will:** Match structures for survival to an organism.

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stomach, lung, brain, and skin.		**Level I Students will:** Attend to a demonstration of plant and animal structures that support their survival.
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. *Clarification Statement:* Examples of evidence from patterns (may include, but not limited to, Wyoming specific examples) could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.	**SES-4-ESS1-1** Describe that landscapes can change.	**Level IV Students will:** Describe/communicate that landscapes can change over time **Level III Students will:** Describe that landscapes can change. **Level II Students will:** Make observations of landscape differences. **Level I Students will:** Attend to a presentation of landscapes.
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.	**SES-3-5-ETS1-2** Generate more than one possible solution to a problem.	**Level IV Students will:** Generate more than one possible solution to a problem, and communicate which solution is most likely to meet the criteria. **Level III Students will:** Generate more than one possible solution to a problem. **Level II Students will:** Match a solution to the problem that best meets criteria of the problem **Level I Students will:** Attend to activities that compare possible solutions to a problem.

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Grade 5

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5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances. *Clarification Statement:* Determination of the new substance is based on the properties of the resulting substance, which could include quantitative (e.g. weight) and qualitative properties (e.g. state of matter, color, texture, and odor).	**SES-5-PS1-4** Determine whether mixing two substances results in a new substance.	**Level IV Students will:** Determine, and communicate, which mixtures results in a new substance. **Level III Students will:** Determine whether mixing two substances results in a new substance **Level II Students will:** Observe, and determine, which two substances, when mixed, results in a new substance. **Level I Students will:** Attend to teacher mixing two substances which results in a new substance, and mixing two substances which results in no new substance.
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. *Clarification Statement:* Examples of models could include diagrams, and flow charts.	**SES-5-PS3-1** Use models to describe that plants capture energy from sunlight.	**Level IV Students will:** Use a model to describe that energy in animals' food was once energy from the sun. **Level III Students will:** Use models to describe that plants capture energy from sunlight. **Level II Students will:** Identify that plants need sunlight to grow. **Level I Students will:** Attend to pictures of plants with the sun and pictures of plants without sun
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. *Clarification Statement:* Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms,	**SES-5-LS2-1** Use a model to describe a food chain with multiple organisms.	**Level IV Students will:** Develop a model to describe a food chain with multiple organisms. **Level III Students will:** Use a model to describe a food chain with multiple organisms **Level II Students will:** Match the organism to the matter that is associated with the organism in the food chain. **Level I Students will:** Attend to a presentation of a food chain with multiple organisms.

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ecosystems, and the Earth.		
5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. *Clarification Statement:* Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.	**SES-5-ESS1-2** Investigate changes in shadows and/or daily changes in day and night.	**Level IV Students will:** Using a model, describe changes in shadows and/or daily changes in day and night. **Level III Students will:** Investigate changes in shadows and/or daily changes in day and night. **Level II Students will:** Observe changes in shadows and/or daily changes in day and night. **Level I Students will:** Attend to a demonstration that shows changes in shadows and/or daily changes in day and night.
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to conserve Earth's resources and environment.	**SES-5-ESS3-1** Describe a way to reuse or recycle a resource.	**Level IV Students will:** Describe ways reusing or recycling a resource is a benefit. **Level III Students will:** Describe a way to reuse or recycle a resource. **Level II Students will:** Explore ways to reuse or recycle a resource **Level I Students will:** Attend to others reusing or recycling a resource
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.	**SES-3-5-ETS1-3** Determine whether or not an engineering design product meets criteria, and communicate failure point(s).	**Level IV Students will:** Determine whether or not the engineering design product meets criteria, communicate failure point(s), and provide possible improvements. **Level III Students will:** Determine whether or not an engineering design product meets criteria, and communicate failure point(s). **Level II Students will:** Determine whether or not an engineering design product meets criteria. **Level I Students will:** Attend to activities that carry out fair tests in which failure points in an engineering design product are compared and improved.

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Grade 6-8

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MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures. *Clarification Statement:* Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.	**SES-MS-PS1-1** Model how simple parts can be put together to make more complex structures.	**Level IV Students will:** Model how simple parts can be put together to make a common chemical molecule. **Level III Students will:** Model how simple parts can be put together to make more complex structures. **Level II Students will:** Select two common objects that can be combined to make a familiar, complex structure. **Level I Students will:** Attend to lessons modeling simple parts being put together to make complex structures.
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. *Clarification Statement:* 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	**SES-MS-PS1-4** Describe the relationship between changes in temperature, kinetic energy, and changes in states of matter for water.	**Level IV Students will:** Predict what will happen if you add energy to water or take energy away. **Level III Students will:** Describe the relationship between changes in temperature, kinetic energy, and changes in states of matter for water. **Level II Students will:** Identify a state of matter for water. **Level I Students will:** Engage with solids and liquids.

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could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.		
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. *Clarification Statement:* Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms that represent atoms.	**SES-MS-PS1-5** Show that the amount of a substance used in a reaction does not change even if the new substance looks different.	**Level IV Students will:** Use a model to demonstrate that the total mass does not change in a chemical reaction. **Level III Students will:** Show that the amount of a substance used in a reaction does not change even if the new substance looks different. **Level II Students will:** Indicate the number of objects that are put into a container is the same number that can be taken out. **Level I Students will:** Attend to tasks and/or demonstrations showing that what goes into a container is the same as what comes out.
MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. *Clarification Statement:* Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.	**SES-MS-PS2-1** Investigate, and describe, the direction of motion of two colliding objects of equal and of unequal masses.	**Level IV Students will:** Predict the resulting direction of motion of two colliding objects of equal and of unequal masses). **Level III Students will:** Investigate, and describe, the direction of motion of two colliding objects of equal and unequal masses. **Level II Students will:** Produce collisions between two objects of equal and of unequal masses. **Level I Students will:** Observe collisions between two objects.
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	**SES-MS-PS2-2** Investigate and describe the change in an object's motion based on the forces on the object and	**Level IV Students will:** Investigate and predict the change in an object's motion based on the forces on the object and the mass of the object. **Level III Students will:**

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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), frame of reference, and specification of units.	the mass of the object.	Investigate and describe the change in an object's motion based on the forces on the object and the mass of the object. **Level II Students will:** Participate in an investigation that shows the change in an object's motion based on the forces on the object and the mass of the object. **Level I Students will:** Attend to an investigation that shows the change in an object's motion based on the forces on the object and the mass of the object.
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. *Clarification Statement:* Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems	**SES-MS-PS3-2** Identify differing amounts of potential energy on a labeled diagram.	**Level IV Students will:** Order a group of objects from least to greatest amount of potential energy. **Level III Students will:** Identify differing amounts of potential energy on a labeled diagram. **Level II Students will:** Participate in a discussion about position and potential energy. **Level I Students will:** Attend to a lesson about potential energy.

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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. *Clarification Statement:* Examples of experiments could include: comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.	**SES-MS-PS3-4** Investigate and describe the change in a substance's temperature when the type of matter, mass, or the amount of energy transferred is changed.	**Level IV Students will:** Investigate and predict how a change in the type of matter, the mass, or the amount of energy transferred to a substance changes the substance's temperature. **Level III Students will:** Investigate and describe how a change in the type of matter, the mass, or the amount of energy transferred to a substance changes the temperature of the substance. **Level II Students will:** Participate in an investigation that shows how a change in the type of matter, the mass, or the amount of energy transferred to a substance changes the temperature of the substance. **Level I Students will:** Attend to an investigation that shows how a change in the type of matter, the mass, or the amount of energy transferred to a substance changes the temperature of the substance.
MS-PS4-1 Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave. *Clarification Statement:* Emphasis is on describing waves with both qualitative and quantitative thinking.	**SES-MS-PS4-1** Identify larger amplitude waves as having more energy.	**Level IV Students will:** Measure the amplitude of two different waves to communicate the difference in energy quantitatively. **Level III Students will:** Identify larger amplitude waves as having more energy. **Level II Students will:** Select the larger amplitude of two wave patterns. **Level I Students will:** Attend to a diagram of waves.
MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	**SES-MS-PS4-2** Describe how light waves behave when interacting with various materials.	**Level IV Students will:** Select an object that reflects light, a material that absorbs light, and a substance that light can be transmitted through. **Level III Students will:**

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Clarification Statement: Emphasis is on both electromagnetic and mechanical waves. Examples of models could include: drawings, simulations, and written descriptions.		Describe how light waves behave when interacting with various materials. **Level II Students will:** Observe a laser light interacting with different liquids. **Level I Students will:** Observe light being reflected.
MS-LS1-2 Develop and use models to describe the parts, functions, and basic processes of cells. *Clarification Statement:* Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Basic processes of a cell should include, but are not limited to, cell growth and reproduction.	**SES-MS-LS1-2** Explore, and identify, the structure and function of major parts of a cell. Clarification of major structures: limited to nucleus, cell membrane, cell wall, and chloroplast.	**Level IV Students will:** Identify the difference between plant and animal cells. **Level III Students will:** Explore, and identify, the structure and function of major parts of a cell. **Level II Students will:** Identify major structures within a plant cell. **Level I Students will:** Attend to a lesson about cells and their function.
MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. *Clarification Statement:* Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.	**SES-MS-LS1-3** Model that a body system is made up of interacting organs.	**Level IV Students will:** Describe how various body systems interact. **Level III Students will:** Model that a body system is made up of interacting organs. **Level II Students will:** Identify organs within various body systems. **Level I Students will:** Attend to the lesson about the various organs within a body system.
MS-LS1-6 Construct a scientific explanation based on evidence for the	**SES-MS-LS1-6** Model what a plant uses, what it creates,	**Level IV Students will:** Design an experiment to determine what would occur to a plant if one of the

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role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. *Clarification Statement:* Emphasis is on tracing movement of matter and flow of energy.	and what the plant releases during photosynthesis.	needed aspects of photosynthesis was missing. **Level III Students will:** Model what a plant uses, what it creates, and what the plant releases during photosynthesis. **Level II Students will:** Discuss/identify the specific things that are required in order for photosynthesis to occur. **Level I Students will:** Attend to a lesson on photosynthesis.
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. *Clarification Statement:* Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system	**SES-MS-LS2-3** Explain that energy moves among living and non-living parts of an ecosystem.	**Level IV Students will:** Model an energy flow sequence. **Level III Students will:** Explain that energy moves among living and non-living parts of an ecosystem. **Level II Students will:** Recognize that people and animals eat. **Level I Students will:** Attend to a lesson about animals eating different things.
MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services. *Clarification Statement:* Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and societal considerations	**SES-MS-LS2-5** Identify an action that maintains or improves ecosystems and biodiversity.	**Level IV Students will:** Communicate the effects of an action that improves ecosystems or biodiversity. **Level III Students will:** Identify an action that maintains or improves ecosystems and biodiversity. **Level II Students will:** Distinguish between images that show high biodiversity and low biodiversity. **Level I Students will:** Attend to a lesson about biodiversity
MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on	**SES-MS-LS3-1** Explain that organisms have differences in their traits that can affect	**Level IV Students will:** Identify changes in an organism that would lead to changes in the chance of survival for the organism.

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chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. *Clarification Statement:* Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.	their survival.	**Level III Students will:** Explain that organisms have differences in their traits that can affect their survival. **Level II Students will:** Select a beneficial environment for an organism based on its physical traits. **Level I Students will:** Attend to a lesson about physical traits of organisms.
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. *Clarification Statement:* Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.	**SES-MS-LS3-2** Students will investigate, and identify, features of living organisms that come from their parents.	**Level IV Students will:** Students will use a model (Punnett Square) to describe results in offspring with genetic variation. **Level III Students will:** Students will investigate, and identify, features of living organisms that come from their parents. **Level II Students will:** Identify similarities and differences between plant and animal parents and their offspring. **Level I Students will:** Attend to, and recognize, that organisms differ within the same species.
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 under the assumption that natural laws operate today as in the past. *Clarification Statement:* Emphasis is on finding patterns of changes in the	**SES-MS-LS4-1** Compare fossils with plants and animals that exist today.	**Level IV Students will:** Using a model of a fossil record, identify extinction points of a fossil organism. **Level III Students will:** Compare fossils with plants and animals that exist today. **Level II Students will:** Examine various fossils. **Level I Students will:** Attend to information presented about fossils.

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level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.		
MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. *Clarification Statement:* Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the positive and negative impacts these technologies have on society as well as the technologies leading to these scientific discoveries.	**SES-MS-LS4-5** Identify desirable traits that can be passed on to offspring.	**Level IV Students will:** Communicate a specific example of how humans have selected a desirable trait in an organism. **Level III Students will:** Identify desirable traits that can be passed on to offspring. **Level II Students will:** Recognize the concept that parents pass traits to their offspring. **Level I Students will:** Attend to a lesson about organisms with traits that humans have influenced.
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. *Clarification Statement:* Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to	**SES-MS-LS4-6** Demonstrate understanding that natural selection changes distribution of traits in a population over time.	**Level IV Students will:** Use a graph that shows how a specific trait changes in distribution over time, and predict how the trait distribution will change in the future. **Level III Students will:** Demonstrate understanding that natural selection changes distribution of traits in a population over time. **Level II Students will:** Identify traits that are beneficial for different organisms. **Level I Students will:** Attend to images of populations that include individuals with different traits.

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populations over time.		
MS-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. *Clarification Statement:* Examples of models can be physical, graphical, or conceptual.	**SES-MS-ESS1-1** Model the Earth-sun-moon positions for lunar phases, eclipses of the sun and moon, and seasons.	**Level IV Students will:** Model the Earth-sun-moon positions and visual effects for lunar phases, eclipses of the sun and moon, and seasons. **Level III Students will:** Model the Earth-sun-moon positions for lunar phases, eclipses of the sun and moon, and seasons. **Level II Students will:** Label the Earth-sun-moon positions for lunar phases and eclipses of the sun and moon, and seasons. **Level I Students will:** Observe/participate in demonstrations showing Earth-sun-moon positions for lunar phases and eclipses of the sun and moon, and seasons.
MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. *Clarification Statement:* Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).	**SES-MS-ESS1-2** Model that the solar system is a collection of many varied objects, held together by gravity, that move in predictable ways. Teacher note: varied objects can include the sun, planets, moon, asteroid belt, etc.	**Level IV Students will:** Model, and identify, the object that is the source of gravity influencing the predictable movement patterns. **Level III Students will:** Model that the solar system is a collection of many varied objects, held together by gravity, that move in predictable ways. **Level II Students will:** Model the movement of space objects, around a center object, to represent the force of gravity **Level I Students will:** Attend to a lesson about space object movement.

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MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. *Clarification Statement:* Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.	**SES-MS-ESS2-1** Model the cycling processes involved in the creation of various rock forms.	**Level IV Students will:** Model the rock cycle in order of rock forms and processes. **Level III Students will:** Model the cycling processes involved in the creation of various rock forms. **Level II Students will:** Compare the different rock forms. **Level I Students will:** Attend/interact with rocks.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. *Clarification Statement:* Examples of data include 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).	**SES-MS-ESS2-3** Compare locations of fossils, rocks, continental shapes, and structures as evidence of past plate motions.	**Level IV Students will:** Organize evidence of past formation of Earth's continents using a map. **Level III Students will:** Compare locations of fossils, rocks, continental shapes, and structures as evidence of past plate motions. **Level II Students will:** Recognize that plates move and change Earth's surface. **Level I Students will:** Attend to a lesson about past plate motions, and evidence that supports the movement.
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. *Clarification Statement:* Emphasis is on the ways water changes its state as it moves through the multiple	**SES-MS-ESS2-4** Identify the processes involved in the cycling of Earth's water.	**Level IV Students will:** Model the water cycle in correct order of processes. **Level III Students will:** Identify the processes involved in the cycling Earth's water. **Level II Students will:** Identify the direction in which water moves through the water cycle **Level I Students will:**

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pathways of the hydrologic cycle. Examples of models can be conceptual or physical.		Attend to a lesson about the water cycle.
MS-ESS2-6 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. *Clarification Statement:* Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlightdriven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.	**SES-MS-ESS2-6** Identify how latitude and altitude influence climate.	**Level IV Students will:** Identify how climate patterns vary based on latitude, altitude, and geographic land distributions. **Level III Students will:** Identify how latitude and altitude influence climate. **Level II Students will:** Compare various climates. **Level I Students will:** Attend to a lesson about climate.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment. *Clarification Statement:* Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and	**SES-MS-ESS3-3** Model ways that humans can minimize their impact on the environment.	**Level IV Students will:** Develop and execute a plan to minimize their impact on their current environment. **Level III Students will:** Model ways that humans can minimize their impact on the environment. **Level II Students will:** Recognize the ways that humans impact their environment. **Level I Students will:** Attend to a lesson about humans interacting with their environment.

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evaluating solutions that could manage that impact. Examples of human impacts can include conservation techniques, water usage (such as municipal withdrawals, industrial applications, and irrigation), land usage (such as urban development, recreation, agriculture, or reclamation), and pollution.		
MS-ETS1-1 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. *Clarification Statement:* Example problems could include citing and designing a retirement home, a hospice building, or a new Junior High School within the city.	**SES-MS-ETS1-1** Describe a problem that needs to be solved.	**Level IV Students will:** Develop possible solutions for a selected problem. **Level III Students will:** Describe a problem that needs to be solved. **Level II Students will:** Recognize a problem that can be solved when presented with a specific scenario. **Level I Students will:** Attend to a visualization of a problem and its solution.
MS-ETS2-2 Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short- and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual	**SES-MS-ETS2-2** Identify consequences of human choices.	**Level IV Students will:** Identify how their personal choices affect others and their environment. **Level III Students will:** Identify consequences of human choices. **Level II Students will:** Identify choices made throughout their day. **Level I Students will:** Attend to a lesson about choices and consequences.

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property rights might constrain future development. *Clarification Statement:* The model could be mathematical, tabular, or graphic. Examples of impacted activities could include agriculture, medicine, energy production and water resources. Constraints on human impacts could include balancing costs, benefits, and risks to society		

Grade HS

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HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. *Clarification Statement:* Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.	**SES-HS-PS1-1** Using a model, identify the parts of an atom (protons, neutrons, electrons).	**Level IV Students will:** Identify how many electrons are in the outermost energy level of an atom. **Level III Students will:** Using a model, identify the parts of an atom (protons, neutrons, electrons). **Level II Students will:** Identify a diagram or model of an atom. **Level I Students will:** Attend to a lesson about atomic structure.
HS-PS1-2 Construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the	**SES-HS-PS1-2** Use a periodic table to identify symbols and atomic numbers for five main group	**Level IV Students will:** Use a Periodic Table to identify symbols, and atomic numbers, for main group elements (1-20). **Level III Students will:**

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periodic table, and knowledge of the patterns of chemical properties, and revise, as needed. *Clarification Statement:* Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.	elements (1-20.)	Use a Periodic Table to identify the symbol, and the atomic number, for five main group elements (1-20). **Level II Students will:** Use a Periodic Table to identify symbols, and atomic numbers, for two main group elements (1-20). **Level I Students will:** Attend to a lesson on the information found in a periodic table.
HS-PS1-6 Evaluate the design of a chemical system by changing conditions to produce increased amounts of products at equilibrium, and refine the design, as needed. *Clarification Statement:* Emphasis is on the application of Le Chatelier's Principle by evaluating and refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.	**SES-HS-PS1-6** Conduct a chemical experiment by changing a variable.	**Level IV Students will:** Compare the results of changing a variable in a series of experiments. **Level III Students will:** Conduct a chemical experiment by changing a variable. **Level II Students will:** Identify the independent variable in an experiment. **Level I Students will:** Observe an experiment in which a variable is changed.
HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. *Clarification Statement:* Emphasis is on using mathematical ideas, beyond	**SES-HS-PS1-7** Rearrange models to demonstrate a chemical reaction occurs through the movement of atoms.	**Level IV Students will:** Use mathematical representations or models to describe that the total number of atoms does not change in a chemical reaction and thus mass is conserved. **Level III Students will:** Rearrange models to demonstrate a chemical reaction occurs through the movement of atoms.

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memorization and rote application of problem solving techniques, to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale.		**Level II Students will:** Identify that in a chemical reaction, atoms are rearranged. **Level I Students will:** Identify an object that has mass is made of smaller parts (atoms).
HS-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. *Clarification Statement:* Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.	**SES-HS-PS1-8** Compare models which illustrate fusion, fission, and radioactive decay.	**Level IV Students will:** Create models of fusion, fission, and radioactive decay. **Level III Students will:** Compare models which illustrate fusion, fission, and radioactive decay. **Level II Students will:** Identify models of fission, fusion, and radioactive decay. **Level I Students will:** Attend to a presentation on models of fission, fusion, and radioactive decay.
HS-PS2-3 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. *Clarification Statement:* Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could	**SES-HS-PS2-3** Select between a variety of designs to minimize force on an object, during a collision, and record outcomes.	**Level IV Students will:** Apply scientific and engineering ideas to design a device that minimizes the force on an object during a collision, and record outcomes. **Level III Students will:** Select between a variety of designs to minimize force on an object, during a collision, and record outcomes. **Level II Students will:** Predict (from provided designs) which design will minimize the force on an object during a collision. **Level I Students will:** Observe a demonstration of given designs to minimize the impact of force on

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include a football helmet or a parachute		an object during a collision.
HS-PS2-5 Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	**SES-HS-PS2-5** Conduct an experiment to test for a magnetic field around an electromagnet.	**Level IV Students will:** Conduct an experiment which demonstrates that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. **Level III Students will:** Conduct an experiment to test for a magnetic field around an electromagnet. **Level II Students will:** Identify a magnetic field. **Level I Students will:** Attend to a demonstration of a magnetic field around an electromagnet.
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials. *Clarification Statement:* Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include: why electrically conductive materials are often made of metal; flexible but durable materials are made up of long chained molecules; and pharmaceuticals are designed to interact with specific receptors.	**SES-HS-PS2-6** Demonstrate why material selection is important in building stable structures.	**Level IV Students will:** Build, or design, a stable structure. **Level III Students will:** Demonstrate why material selection is important in building stable structure. **Level II Students will:** Given multiple pictures of familiar structures, select the one that illustrates the strongest structural elements. **Level I Students will:** Attend to a demonstration of why material selection is important in building a stable structure.
HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. *Clarification Statement:* Emphasis is	**SES-HS-PS3-3** Conduct an experiment to convert one form of energy to another form of energy.	**Level IV Students will:** Conduct an experiment which demonstrates devices with varying levels of efficiency and compare the results. **Level III Students will:** Conduct an experiment to convert one form of energy to another form of

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on both qualitative and quantitative evaluations of devices. Examples of devices could include high- efficiency hydrocarbon engines, Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of a variety of energy forms and efficiency.		energy. **Level II Students will:** Given an example or illustration, identify one type of energy in an energy conversion. **Level I Students will:** Attend to a demonstration of energy conversion.
HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. *Clarification Statement:* Examples of data could include electromagnetic radiation traveling in a vacuum or glass, sound waves traveling through air or water, and seismic waves traveling through the Earth	**SES-HS-PS4-1** Demonstrate that simple waves have a repeating pattern with a specific wavelength, frequency, and amplitude.	**Level IV Students will:** Demonstrate how to change the wavelength, frequency, and amplitude of a wave. **Level III Students will:** Demonstrate that simple waves have a repeating pattern with a specific wavelength, frequency, and amplitude. **Level II Students will:** Identify two or more types of waves. **Level I Students will:** Attend to a demonstration of how a wave moves.
HS-PS4-5 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. *Clarification Statement:* Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications	**SES-HS-PS4-5** Identify how waves are used to accomplish tasks or share information.	**Level IV Students will:** Compare and contrast between different energy sources and how the amount of energy affects the wave behavior. **Level III Students will:** Identify how waves are used to accomplish tasks or share information. **Level II Students will:** DIfferentiate between devices that use waves to function versus devices that do not in order to function / operate. **Level I Students will:** Generate waves of different energies.

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technology.		
HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. *Clarification statement:* Explanations emphasize basic DNA replication, transcription, and translation.	**SES-HS-LS1-1** Construct a model of DNA.	**Level IV Students will:** Construct, and label, a model of DNA. **Level III Students will:** Construct a model of DNA. **Level II Students will:** Match a picture of DNA structure to the term DNA. **Level I Students will:** Attend to the construction of a model of DNA.
HS-LS1-6 Construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules. *Clarification Statement:* Emphasis is on using evidence from models and simulations to support explanations. Other hydrocarbons should include, but are not limited to: lipids, carbohydrates, and proteins.	**SES-HS-LS1-6** Construct models of carbon-based molecules.	**Level IV Students will:** Construct, and label, models of carbon- based molecules. **Level III Students will:** Construct models of carbon-based molecules. **Level II Students will:** Recognize a model of a carbon-based molecule. **Level I Students will:** Attend to the construction of a model of a carbon-based molecule.
HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere,	**SES-HS-LS2-5** Construct a model of the carbon cycle to include interaction with the atmosphere.	**Level IV Students will:** Construct and label a model of the carbon cycle to include explanation of cycling among the biosphere, atmosphere, hydrosphere and geosphere. **Level III Students will:**

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atmosphere, hydrosphere, and geosphere.		Construct a model of the carbon cycle to include interaction with the atmosphere. **Level II Students will:** Label the parts of the carbon cycle. **Level I Students will:** Attend to a lesson about the role animals play in the carbon cycle.
HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex biotic and abiotic interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a modified ecosystem. *Clarification Statement:* Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.	**SES-HS-LS2-6** Demonstrate how a change in conditions can change an ecosystem.	**Level IV Students will:** Demonstrate and explain how changing conditions can change an ecosystem. **Level III Students will:** Demonstrate how a change in conditions can change an ecosystem. **Level II Students will:** Recognize factors that can affect changes on an ecosystem. **Level I Students will:** Recognize a factor that can affect change.
HS-LS2-7 Evaluate and assess impacts on the environment and biodiversity in order to refine or design a solution for detrimental impacts or enhancement for positive impacts. *Clarification Statement:* Examples of impacts could include urbanization, reclamation projects, building dams, habitat restoration, and dissemination of invasive species.	**SES-HS-LS2-7** Compare and contrast detrimental or enhancing impacts on the environment.	**Level IV Students will:** Design a solution for a detrimental impact on the environment. **Level III Students will:** Compare and contrast detrimental or enhancing impacts on the environment. **Level II Students will:** Identify impacts on the environment. **Level I Students will:** Observe impacts on the environment.

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HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and /or (3) mutations caused by environmental factors. *Clarification Statement:* Emphasis is on using data to support arguments for the way variation occurs.	**SES-HS-LS3-2** Demonstrate that mutations can occur in DNA.	**Level IV Students will:** Model that a mutation in the DNA can result in a physical change that can be passed onto offspring. **Level III Students will:** Demonstrate that mutations can occur in DNA. **Level II Students will:** Recognize the physical effect of a genetic mutation **Level I Students will:** Attend to a lesson about DNA mutation.
HS-LS4-2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. *Clarification Statement:* Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples	**SES-HS-LS4-2** Demonstrate how a population can adapt to survive.	**Level IV Students will:** Explain how and why adaptations can help a population survive in a given environment. **Level III Students will:** Demonstrate how a population can adapt to survive. **Level II Students will:** Recognize that a population's adaptation assists in its survival. **Level I Students will:** Recognize changes in the environment that necessitate adaptation.

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of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.		
HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. *Clarification Statement*: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.	**SES-HS-LS4-5** Using evidence indicate the emergence of a new species over time.	**Level IV Students will:** Examine and explain the emergence of a new species over time. **Level III Students will:** Using evidence indicate the emergence of a new species over time. **Level II Students will:** Given an adaptation vs. non-adaptation, select the item that demonstrates the adaptation. **Level I Students will:** Given an adaptation, select the environmental condition that would cause it.
HS-LS4-6 Create and/or use a simulation to evaluate the impacts of human activity on biodiversity. *Clarification Statement:* Emphasis is on examining positive and negative impacts of human activity. Examples could include cost benefit analysis of proposed actions, protection for threatened or endangered species, reclamation projects and/or efforts to maintain biodiversity.	**SES-HS-LS4-6** Observe and describe the impacts of human activity on biodiversity.	**Level IV Students will:** Evaluate the impact of human activity on biodiversity. **Level III Students will:** Observe and describe the impacts of human activity on biodiversity. **Level II Students will:** Identify, as positive or negative, various impacts of human activity on biodiversity. **Level I Students will:** Attend to a simulation of the impacts of human activity on biodiversity.

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HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. *Clarification Statement:* Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).	**SES-HS-ESS1-2** Construct a model of the expanding Universe.	**Level IV Students will:** Construct a model of the expanding Universe and that all matter came from a single point. **Level III Students will:** Construct a model of the expanding Universe. **Level II Students will:** Identify a model that illustrates the Big Bang theory. **Level I Students will:** Attend to a model of the expanding Universe.
HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. *Clarification Statement*: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages	**SES-HS-ESS1-5** Use models to explore the theory of plate tectonics.	**Level IV Students will:** Use models to explain the theory of plate tectonics. **Level III Students will:** Use models to explore the theory of plate tectonics **Level II Students will:** Use a model to identify earth's current continental formations. **Level I Students will:** Given picture(s) or models, determine which is land and which is water

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions).		
HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. *Clarification Statement:* Examples of system interactions could include how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; how a decrease in greenhouse gases contributes to a decrease in global surface temperature which leads to an increase in glacial ice, or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.	**SES-HS-ESS2-2** Construct a model demonstrating that one change to Earth's surface can cause changes to other Earth systems.	**Level IV Students will:** Construct, and explain, a model demonstrating that one change to Earth's surface can cause changes to other Earth systems. **Level III Students will:** Construct a model demonstrating that one change to Earth's surface can cause changes to other Earth systems. **Level II Students will:** Identify an Earth surface feature that is going through a change. **Level I Students will:** Attend to a lesson/demonstration of changing Earth surface features.
HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. *Clarification Statement:* Examples of the causes of climate change differ by timescale, over 1-10 years: large	**SES-HS-ESS2-4** Use a model to identify changes in the flow of energy that can change the climate.	**Level IV Students will:** Using a model, evaluate changes in the flow of energy that can change the climate. **Level III Students will:** Use a model to identify changes in the flow of energy that can change the climate. **Level II Students will:**

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volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10- 100s of millions of years: long-term changes in atmospheric composition.		Identify energy changes that can change the climate. **Level I Students will:** Attend to the construction of a model demonstrating changes in the flow of energy that can change the climate.
HS-ESS3-2 Evaluate competing design solutions for developing, managing, and using energy and mineral resources based on cost -benefit ratios. *Clarification Statement:* Cost-benefit analysis should be based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, and ethical considerations). Emphasis needs to include the conservation, recycling, and reuse of resources (e.g., minerals, metals, and water) where possible, and on minimizing impacts where it is not. Examples include developing best practices for wind, hydroelectric, and solar energy, agricultural soil use, mining (for coal and oil shales), and pumping (for petroleum and natural gas).	**SES-HS-ESS3-2** From factors provided, select which factors need to be considered, prior to developing energy or mineral resources.	**Level IV Students will:** Identify factors to consider, prior to developing energy or mineral resources. **Level III Students will:** From factors provided, select which factors need to be considered, prior to developing energy or mineral resources. **Level II Students will:** Identify various energy or mineral resources. **Level I Students will:** Attend to an exploration of various energy and mineral resources.

PROPOSED 2024 WYOMING SCIENCE EXTENDED STANDARDS AND ACHIEVEMENT LEVEL DESCRIPTORS

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
HS-ESS3-3 Use computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. *Clarification Statement:* Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.	**SES-HS-ESS3-3** Predict which resources humans use will affect the local environment the most.	**Level IV Student will:** Give causes and effects of how humans using natural resources can affect biodiversity **Level III Students will:** Predict which resources humans use will affect the local environment the most. **Level II Students will:** Compare renewable and nonrenewable resources. **Level I Students will:** Identify natural resources all living things use.
HS-ESS3-5 Analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impact s to Earth systems. *Clarification Statement:* Examples of evidence, for both data and climate model outputs, are for changes in climate (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmospheric and oceanic composition).	**SES-HS-ESS3-5** Use global climate models to identify global, or regional, change in climate and associated future impacts to Earth systems.	**Level IV Students will:** Compare results from global climate models to make an evidence-based forecast of the current rate of global, or regional, change in climate and associated future impacts to Earth systems. **Level III Students will:** Use global climate models to identify global, or regional, change in climate and associated future impacts to Earth systems. **Level II Students will:** Use global climate models to identify global or regional change in climate. **Level I Students will:** Attend to a presentation about global, or regional, change in climate.
HS-ETS1-3 Evaluate a solution to a complex real-world problem based on	**SES-HS-ETS1-3** Identify solutions to a real-world	**Level IV Students will:** Identify a solution to a real-world problem based on prioritized criteria and

2023 Wyoming Science Content Standards	2024 Wyoming Science Extended Standards	Instructional Achievement Level Descriptors (ALDs)
prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. *Clarification Statement:* Examples could include evaluation of historical, present day, and potential future challenges which take into account shifts in cultural norms and values, societal priorities, and/or technology.	problem based on a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. **Level III Students will:** Identify solutions to a real-world problem based on a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. **Level II Students will:** Identify solutions to a problem that personally affects them based on a range of constraints, including cost, safety, social, and environmental impacts. **Level I Students will:** Identify a solution to a problem that personally affects them and develop a consistent positive response.
HS-ETS1-5 Evaluate the validity and reliability of claims in a variety of materials. *Clarification Statement:* Examples of materials could include trade books, scientific publications, magazines, web resources, videos, and other passages that may reflect bias.	**SES-HS-ETS1-5** Given reliable materials, identify valid vs. invalid claims.	**Level IV Students will:** Identify the validity and reliability of claims in a variety of materials. **Level III Students will:** Given reliable materials, identify valid vs. invalid claims. **Level II Students will:** Identify a truth vs. a lie. **Level I Students will:** Identify real vs. not real.