2018 WYOMING SCIENCE EXTENDED

CONTENT AND PERFORMANCE STANDARDS

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Effective AUGUST 15 , 2018

TO BE FULLY IMPLEMENTED IN DISTRICTS BY THE BEGINNING OF SCHOOL YEAR 2021-2022

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

For Students with the Most Significant Cognitive Disabilities

INTRODUCTION

The current federal mandate, Elementary and Secondary Education Act (ESEA) of 1965 and Every Student Succeeds Act (ESSA) of 2015 require that all students participate in all district and statewide assessments with appropriate accommodations, as necessary.

The Individuals with Disabilities Act of 2004 (IDEA 2004) requires students with the most significant cognitive disabilities be assessed in the same grades as regular education students and to have access to challenging, instructional opportunities linked to the State Standards. These instructional targets are defined in the Extended Content & Performance Standards.

RATIONALE

Wyoming has high academic expectations of all students as evidenced in the Wyoming Content and Performance Standards. The committee, which developed the Science Extended Standards for students with the most significant cognitive disabilities, recognizes the mission of science instruction as providing the essential skills that allow these students to achieve high academic expectations and to access the general academic curriculum. Instructional opportunities addressing the rigorous Extended Content Standards, combined with instructionally supportive assessments, provide targets which enable all students to achieve high standards of academic performance.

The basis of the Science Extended Content Standards is to provide a K-12 framework for instruction for students with the most significant cognitive disabilities (less than 1% of students) and to assist school districts, schools, and communities in developing and strengthening curriculum. These Standards specify the essential learning that these students must master. Teachers ensure that students achieve mastery by using a range of instructional strategies they select based on students' needs and grade-specific, linked Extended Content Standards and Benchmarks. The specifics of how students learn the knowledge and skills are determined at the district level.

Students with the most significant cognitive disabilities vary widely in their forms of communication and access skills. The basic skills crucial to successful science instruction are embedded at all benchmark levels. A teacher's instruction to these crucial skills is differentiated on an individual basis, dependent on the student's skills, ability, and communication level. Students with the most significant cognitive disabilities access challenging standards at varying levels of complexity and often through the use of a wide range of accommodations and assistive technology.

ORGANIZATION OF EXTENDED ACADEMIC STANDARDS

The Science Extended Content Standards specify the essential learning that must be mastered, by each grade and throughout the student's K-12 education. Kindergarten through fifth grade teachers, students, and parents work toward the achievement of grade-level specific academic benchmarks. Sixth through eighth grade and ninth through twelfth grade teachers, students, and parents work toward the achievement of the middle school grade-band and the high school grade-band academic benchmarks, respectively. Success at each benchmark level requires the effort and commitment of all who prepare for that level.

The Science Standards are organized into grades K, 1, 2, 3, 4, 5, and into grade spans: 6 – 8, and 9 – 12. They are presented in a three-column format. The first column shows the Performance Expectation (benchmark) for the general 2016 Science Standards. The second column is a statement of the extended science benchmark. The third column lists the Performance Level Descriptors (PLDs) in four levels and provides some examples for educators from which to draw. The PLDs define the consistency and levels of independence associated with the Benchmark as the cognitive complexity and performance of the skill increases from a Level 1 (most basic) to a Level 4 (more complex).

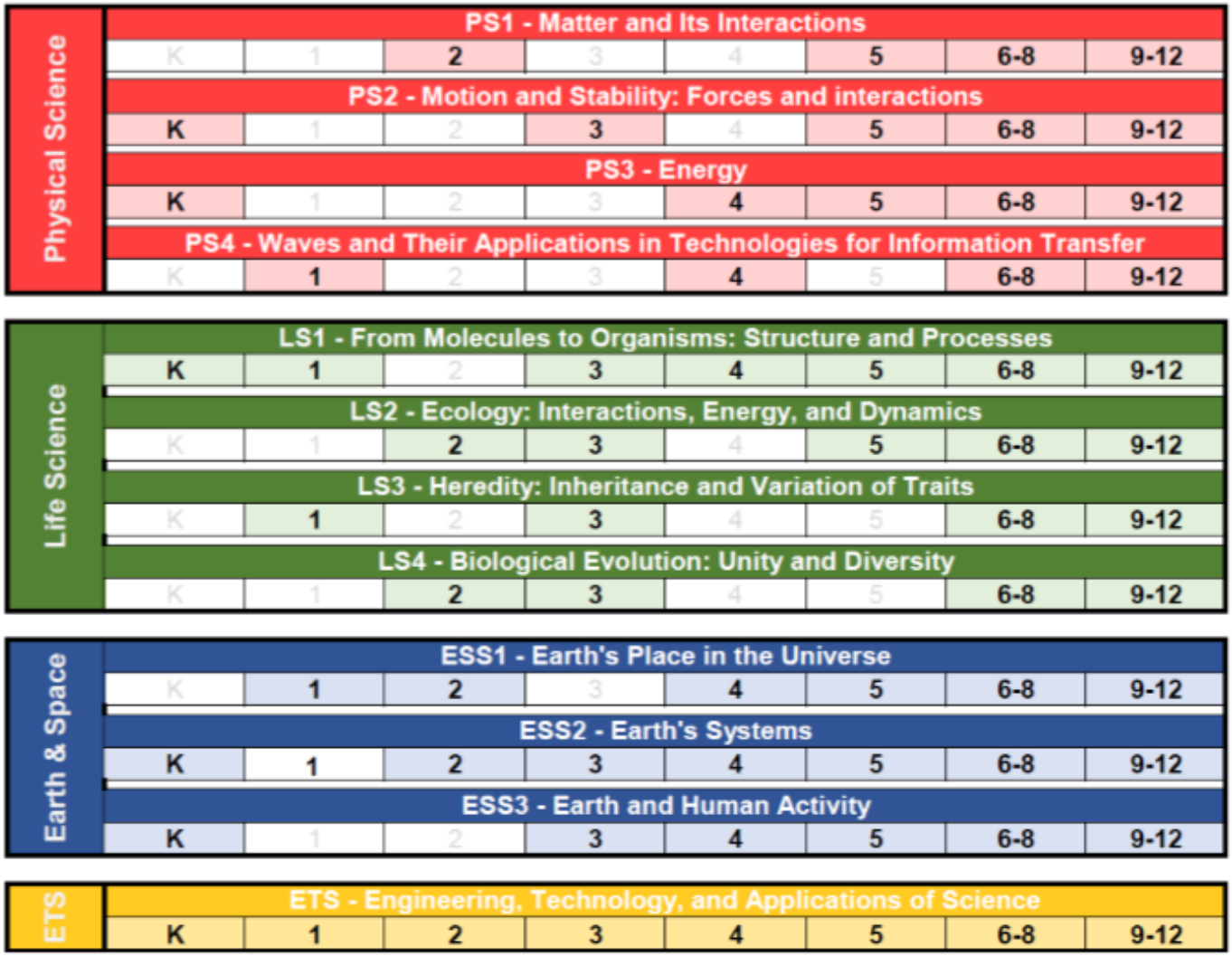
The standards are organized into four Domains: 1) Physical Science (PS), 2) Life Science (LS), 3) Earth and Space Science (ESS), and 4) Engineering, Technology, and Applications of Science (ETS). Each Science Extended Standard (SES) is an extension of the general Science Standards. In some instances, two Benchmarks have been combined or integrated and so are represented in the Benchmark column. Teachers should be informed of the requirements at the next level of Benchmarks, as they prepare instruction for the current grade level of individual students, in order that prerequisite skills are introduced and addressed over time. They must also be informed of the requirements at the previous level so they provide practice opportunities and application for skills that have already been mastered.

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ORGANIZATION OF STANDARDS

The 2018 Science Extended Standards are an extension of the 2016 Science Standards which were informed by *A Framework for K-12 Science Education* (National Research Council, 2012), the Next Generation Science Standards (National Academies Press, 2013), and the unique needs of Wyoming. They are distinct from prior science standards in that they integrate three dimensions of learning within each standard and have intentional connections across standards, grade bands, and subjects. The three dimensions are crosscutting concepts, disciplinary core ideas, and science and engineering practices.

2018 Wyoming Science Extended Content and Performance Standards



HOW TO READ THIS DOCUMENT

Grade Level

Science Benchmark

4-ESS1-1 means Grade 4, Earth & Space Science, Standard 1, Benchmark 1.

Science Standard

Performance Level Descriptors (PLDs)

PLDs help teachers assess the student's performance of the benchmark.

Level IV - Advanced, Level III - Proficient, Level II - Basic, Level I - Below Basic.

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Use a picture of river eroding the landscape, videos of lava flowing from volcanoes, etc.* **Level III Students will:** **Describe that landscapes can change.** *Ex. Use pictures of a volcano blowing up, land side, tsunami, etc.* **Level II Students will:** **Make observations of landscape differences.** *Ex. Compare pictures of different landscapes.* **Level I Students will:** **Attend to a presentation of landscapes.**

Clarification Statement

Provides further explanation or examples to support educators.

Symbol

Wyoming examples are given or can be considered in

Science Extended Benchmark

SES-4-ESS1-1 means Science Extended Standard, Grade 4, Earth & Space Science, Standard 1, Benchmark 1.

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS
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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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**. *Ex. Make predictions about the motions of an object (e.g., What will happen if an object is pushed harder?).* *Ex. Guided investigation with items to show cause and effect when an object is pushed hard or soft, uphill, downhill.* **Level III Students will:** **Identify the effects of pushes and pulls on the motion of an object.** *Ex. People must push harder to move their bikes, skateboards, or scooters to go faster or as they go up a hill.* *Ex. Information about motion can be represented in pictures, illustrations, and simple charts.* **Level II Students will:** **Participate in activities that demonstrate how different objects move.** *Ex. People use pushes and pulls to move everyday objects such as skateboards, scooters, or wagons.* **Level I Students will:** **Attend to activities that demonstrate how objects move.** *Ex. Objects (e.g. toy cars, balls, etc.) can be moved through force.*
K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.	**SES-K-PS2-2. Identify changes in the speed of an object that occur with a push or pull.**	**Level IV Students will:** **Determine if a design solution works as intended to change the speed of an object with a push or a pull.** *Ex. Determine whether or not a marble moves through a course as intended.* **Level III Students will:** **Identify changes in the speed of an object that occur with a push or pull.** *Ex. Pushing or pulling on an object can change the speed.* **Level II Students will:** **Investigate changes in the speed of an object that occur with a push or pull.** *Ex. Push a marble down a ramp.* **Level I Students will:** **Attend to objects being pushed and pulled.** *Ex. A ball can be pushed or pulled.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.	**SES-K-PS3-1. Identify the effect of sunlight on Earth's surface.**	**Level IV Students will:** **Make observations to determine the effect of sunlight on Earth's surface.** *Ex.* Observe the differences in temperature and light using *objects (e.g. sand, soil, rocks, and water) that have been in and out of the sun.* **Level III Students will:** **Identify the effect of sunlight on Earth's surface.** *Ex. The sun provides heat and light to the Earth. (Impact terms e.g., Heat, light) The sun makes me warm.* *Ex. There are differences between night and day. (Qualitative Labels e.g., light, dark) The sun gives me light.* **Level II Students will:** **Identify the sun as a source of heat and light.** *Ex. Provided with a picture of the moon and the sun student can choose which provides heat.* *Ex. Given 2 pictures student chooses picture of daytime.* **Level I Students will:** **Attend to activities that demonstrate the effect of sunlight on the Earth's surface.**
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.** *Ex. Use clay to build a shaded area.* **Level III Students will:** **Identify structures that will reduce the warming effect of sunlight.** *Ex. umbrella, tree shade, etc.* **Level II Students will:** **Recognize that certain structures reduce the warming effect of sunlight.** *Ex. Notice the difference in temperature under the shade and directly in the sun.* **Level I Students will:** **Attend to activities that demonstrate how structures reduce the warming effect of sunlight.**

LS1 – From Molecules to Organisms: Structures & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. Clarification Statement: Examples of patterns could include that animals need to take in food but plants make their own food; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.	**SES-K-LS1-1. Describe the basic needs that animals have for survival.**	**Level IV Students will:** **Identify things in the environment that provide basic needs for plants and animals to survive.** *Ex. Some animals eat plants, plants need water and sun.* **Level III Students will:** **Describe the basic needs that animals have for survival.** *Ex. Animals need food, water, shelter.* **Level II Students will:** **Identify a basic need that living things require for survival.** *Ex. Show pictures of items that an animal may need to survive or not (shelter, food, air, water).* **Level I Students will:** **Attend to activities demonstrating the basic needs of living things.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.	**SES-K-ESS2-1. Identify local weather conditions.**	**Level IV Students will:** **Share observations of weather conditions using qualitative labels and quantitative labels**. *Ex. Daily weather charting.* **Level III Students will:** **Identify local weather conditions** *Ex. sunny, cloudy, rainy, and warm (Today is sunny and warm.)* **Level II Students will:** **Match materials appropriate for weather.** *Ex. clothing, recreation, or transportation for rain, snow, sun, etc.* **Level I Students will:** **Attend to activities that demonstrate changes in weather.**
K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.	**SES-K-ESS2-2.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not Applicable.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 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.	**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.** *Ex. Draw a picture of an animal in their "home".* **Level III Students will:** **Describe how animals meet their needs based on where they live.** *Ex. Deer live in the forest because the forest provides food and shelter.* **Level II Students will:** **Match animals to the place they live.** *Ex. Deer to forest, Fish to water.* **Level I Students will:** **Attend to activities that demonstrate the relationship between animals and where they live.**
K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. Clarification Statement: Emphasis is on local forms of severe weather.	**SES-K-ESS3-2. Identify and communicate local forms of severe weather and their warning signals.**	**Level IV Students will:** **Identify, and communicate, local forms of severe weather and demonstrate an appropriate response.** *Ex. Depending on location this could include tornados/earthquakes, go to a secure area.* **Level III Students will:** **Identify, and communicate, local forms of severe weather and their warning signals.** *Ex. A siren would sound if a tornado is coming.* *Ex. An emergency broadcast system or alarm system as utilized on media (TV, radio, computer, phone).* **Level II Students will:** **Recognize local forms of severe weather.** *Ex. tornados, earthquakes, storms, blizzards, etc.* **Level I Students will:** **Attend to activities that demonstrate local forms of severe weather.**
K -ESS3-3. Communicate solutions that will manage the impact of humans on the land, water, air, and/or other living things in the local environment. Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.	**SES-K-ESS3-3.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not Applicable.**

K-2-ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Would you brush your teeth with a toothbrush or a screwdriver?* **Level II Students will:** **Match the tool to the use.** *Ex. toothbrush - teeth, screwdriver- screw, hammer – nail, etc.* **Level I Students will:** **Attend to activities that demonstrate tools being used to solve problems.**
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.** *Ex. Show how a spoon will work better than a fork to eat soup because it is rounded.* **Level III Students will:** **Identify the shape of an object and its function.** *Ex. A ball is round so it can roll.* *Ex: A tire is round so it can roll.* **Level II Students will:** **Match an object with a shape.** *Ex. A ball is a circle, a block is a square.* **Level I Students will:** **Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.**
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**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.** *Ex. Try to eat soup with a fork and a spoon and communicate the results.* *Ex. Compare shoes with laces to shoes with Velcro.* **Level III Students will:** **Identify the differences of two objects designed to solve the same problem.** *Ex. Discuss the differences between using a fork or a spoon to eat soup.* **Level II Students will:** **Match the tool to solve the given problem.** *Ex. spoon with soup, fork with meat, hammer with nail, screwdriver and screw, etc.* **Level I Students will:** **Attend to activities that compare two objects designed to solve the same problem.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.	**SES-1-PS4-1. Demonstrate that a material can produce sound through vibration.**	**Level IV Students will:** **Conduct an investigation to demonstrate that various materials can produce different sounds through vibration.** *Ex. When plucking a string or flicking a ruler, notice the different sounds; utilize technology that shows sound waves when you make a sound.* **Level III Students will:** **Demonstrate that a material can produce sound through vibration.** *Ex. With a tuning fork, rubber band, or container of water sitting on drum - pound the drum and watch the vibrations in the water, etc.* **Level II Students will:** **Recognize that vibration can cause sound.** *Ex. Listening to different sounds made by vibrating materials* **Level I Students will:** **Attend to activities that demonstrate how sounds can be made through vibrating materials.**
1-PS4-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated. Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.	**SES-1-PS4-2. Demonstrate and communicate that objects in darkness can be seen with a light source.**	**Level IV Students will:** **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** **Level III Students will:** **Demonstrate, and communicate, that objects in darkness can be seen with a light source.** *Ex. Communicate that they cannot see all properties of an object in the dark need to shine a light on a dark object.* **Level II Students will:** **Identify that objects can be seen when provided with a light source.** *Ex: Have students look into a dark box and identify that they cannot see an object, vs. when light is available they can see an object in the box.* **Level I Students will:** **Attend to activities that demonstrate that objects can be seen with a light source.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-PS4-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light. Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).	**SES-1-PS4-3. Identify a material that will allow a beam of light to shine through.**	**Level IV Students will:** **Demonstrate how different materials change the path of a beam of light.** *Ex. Transparent, translucent, opaque, reflective items and how they change/do not change the path of a beam of light.* **Level III Students will:** **Identify a material that will allow a beam of light to shine through.** *Ex. glass, plastic bag, cardboard, wax paper, clear plastic, etc.* **Level II Students will:** **Investigate how different materials change the path of a beam of light.** *Ex. glass, plastic bag, cardboard, clear plastic, etc.* **Level I Students will:** **Attend to activities that demonstrate how different materials change the path of a beam of light.**
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 drum beats.	**SES-1-PS4-4. Identify multiple devices that communicate over a distance.**	**Level IV Students will:** **Create a device that communicates over a distance.** *Ex. paper cup and string "telephones", drum beat pattern, flashlight signal, etc.* **Level III Students will:** **Identify multiple devices that communicate over a distance.** *Ex. doorbell, phone, whistle, stoplight, school bell system, etc.* **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 distance.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. bike helmet-turtle shell, clothing- fur, purse- kangaroo pouch, umbrella- leaves, etc.* **Level III Students will:** **Identify an object used by humans that mimics an animal's or a plant's external parts.** *Ex. Bike helmet-turtle shell, clothing- fur, purse- kangaroo pouch, umbrella- leaves, cultural examples may be included here.* **Level II Students will:** **Match the animal/plant external part to the human object that serves a similar purpose.** *Ex. Bike helmet-turtle shell, clothing- fur, purse- kangaroo pouch, umbrella- leaves, cultural examples may be included here.* **Level I Students will:** **Attend to activities that compare an animal's or plant's external parts to human objects that solve problems.**
1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).	**SES-1-LS1-2. Identify behavior of parents and offspring that help the offspring survive.**	**Level IV Students will:** **Determine similarities of different parent and offspring behavior to ensure survival when being exposed to text and media.** *Ex. Show different clips of parents feeding offspring and notice that offspring and parents are different in the way that the offspring needs the parent to be fed and parents can get their own food for survival.* **Level III Students will:** **Identify behavior of parents and offspring that help the offspring survive.** *Ex. Baby birds chirp and parent birds feed them.* **Level II Students will:** **Match pictures of offspring behaviors to their parents' response to ensure survival.** *Ex. parent with bottle- baby crying, bird with worm- chick chirping, etc.* **Level I Students will:** **Attend to activities that demonstrate the connection between offspring behaviors, to parent responses, that ensure survival.**

LS3 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.	**SES-1-LS3-1. Given a variety of choices, match images of parents and their offspring.**	**Level IV Students will:** **Observe and communicate how adults and their offspring are alike but are not identical.** *Ex. Baby chicks and chickens both have feathers but the baby chick is yellow and the adult chicken is white.* **Level III Students will:** **Given a variety of choices, match images of parents and their offspring.** *Ex. chicken/chick, horse/foal, human/baby, cow/calf, cat/kitten, dog/pup, etc.* **Level II Students will:** **Given two choices, match the offspring to the correct parent.** *Ex. horse and cow /calf, human and cat/ baby, dog and horse/pup, etc.* **Level I Students will:** **Attend to activities that demonstrate how adult animals are similar but not identical to their offspring.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. This could include sorting image cards, a model, or a description.* **Level III Students will:** **Identify which objects are found in the sky during the day and at night.** *Ex. The sun is seen during the day, the stars are seen at night.* **Level II Students will:** **Distinguish between daytime sky and nighttime sky** *Ex. Show two pictures, sort pictures of day and night.* **Level I Students will:** **Attend to activities that demonstrate how objects found in the sky are different during the day and night.**
1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year. Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.	**SES-1-ESS1-2.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**

K-2-ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Would you brush your teeth with a toothbrush or a screwdriver?* **Level II Students will:** **Match the tool to the use.** *Ex. toothbrush - teeth, screwdriver- screw, hammer – nail, etc.* **Level I Students will:** **Attend to activities that demonstrate tools being used to solve problems.**
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.** *Ex. Show how a spoon will work better than a fork to eat soup because it is rounded.* *Ex. Compare shoes with laces to shoes with Velcro.* **Level III Students will:** **Identify the shape of an object and its function.** *Ex. A ball is round so it can roll.* *Ex: A tire is round so it can roll.* **Level II Students will:** **Match an object with a shape.** *Ex. A ball is a circle, a block and a square.* **Level I Students will:** **Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.**
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**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.** *Ex. Try to eat soup with a fork and a spoon and communicate the results.* **Level III Students will:** **Identify the differences of two objects designed to solve the same problem.** *Ex. Discuss the differences between using a fork or a spoon to eat soup.* **Level II Students will:** **Match the tool to solve the given problem.** *Ex. spoon with soup, fork with meat, hammer with nail, screwdriver and screw, etc.* **Level I Students will:** **Attend to activities that compare two objects designed to solve the same problem.**

PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.	**SES-2-PS1-1. Describe a material based on its observable properties.**	**Level IV Students will:** **Compare different materials based on their observable properties.** *Ex. Feel the properties of a rock, cotton, slime, and communicate similar and different properties.* **Level III Students will:** **Describe a material based on its observable properties.** *Ex. Feel a rock and describe the properties felt.* **Level II Students will:** **Identify different properties of materials.** *Ex. smooth, rough, porous, etc.* **Level I Students will:** **Attend to activities that demonstrate observable properties of materials.**
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.** *Ex A cloth is absorbent so it will soak up water. A brick is hard so it is good to build with.* **Level III Students will:** **Determine the material that is best suited for an intended purpose.** *Ex. cotton ball/ bricks- house, brick/paper towel-spill, etc.* **Level II Students will:** **Sort different materials by their properties.** *Ex. strength-nails, flexibility-rubber band, hardness- brick, texture-sandpaper, absorbency-paper towel, etc.* **Level I Students will:** **Attend to activities that demonstrate materials being used for their intended purpose.**

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.	**SES-2-PS1-3. Demonstrate that smaller pieces can make a larger object.**	**Level IV Students will:** **Demonstrate that one object can be taken apart and made into a new object.** *Ex. Such as using smaller geometric shapes and creating a different shape; using four squares to make a rectangle.* **Level III Students will:** **Demonstrate that smaller pieces can make a larger object.** *Ex. Can be a computer generated item, or puzzle pieces of three pieces or more.* **Level II Students will:** **Explore that smaller pieces can make an object.** *Ex. Can be a computer-generated item, Unifix cubes, Legos, puzzle, etc.* **Level I Students will:** **Attend to activities that demonstrate that smaller pieces can make a larger object.**
2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.	**SES-2-PS1-4. Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot, and identify an item that changes with heating or cooling.**	**Level IV Students will:** **Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot, and communicate some properties that changed.** *Ex. Water being frozen and then returned to water is an example of a reversible change; pancake batter cannot be reversed after cooking. Boiling an egg cannot be reversed after heating.* **Level III Students will:** **Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot, and identify an item that changes with heating or cooling.** *Ex. See level IV for ideas.* **Level II Students will:** **Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot.** **Level I Students will:** **Attend to a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot.**

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.	**SES-2-LS2-1. Participate in a guided investigation to determine if plants need water to grow, and communicate any observable changes.**	**Level IV Students will:** **Participate in a guided investigation to determine if plants need water to grow, and communicate that plants need water to grow.** *Ex. Do not water a plant and have a control plant that does get water.* **Level III Students will:** **Participate in a guided investigation to determine if plants need water to grow, and communicate any observable changes.** *Ex. The plant changed color, the plant wilted, the plant no longer grows, etc.* **Level II Students will:** **Participate in a guided investigation to determine if plants need water to grow.** **Level I Students will:** **Attend to a guided investigation to determine if plants need water to grow.**
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 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).	**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.** *Ex. Use a cotton ball to represent bees pollinate flowers, play to act out pollination, play to pretend to be birds dropping seeds, etc.* **Level III Students will:** **Participate in activities that demonstrate pollination or seeding, and communicate a way that seeds are dispersed.** *Ex. dandelion seeds float in the air, seeds caught on socks, animals spread seeds, etc.* **Level II Students will:** **Participate in activities that demonstrate pollination or seeding.** **Level I Students will:** **Attend to, or participate in, activities that demonstrate pollination or seeding.**

LS4 – Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Draw a picture of a monkey in the jungle and what would need to be in the jungle for the monkey to survive.* **Level III Students will:** **Make a model of an animal in its habitat.** *Ex. Can be done with characters, drawings, clay, or any medium.* **Level II Students will:** **Match an animal to its correct habitat.** *Ex. fish - water; bear – woods, etc.* **Level I Students will:** **Attend to activities that demonstrate diversity of life in different habitats.**

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.	**SES-2-ESS1-1.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.** **Covered in ESS2-1**	**Not applicable**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Toothpicks in sand to mimic a beaver dam.* **Level III Students will:** **Participate in activities that demonstrate a design made to slow or prevent water from passing, and communicate changes.** *Ex. Different barriers changing the amount of water flowing through a course.* **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.**
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	**SES-2-ESS2-2. Given a visual representation, communicate the difference between bodies of water and landforms.**	**Level IV Students will:** **Develop a model that represents the natural world to differentiate between landforms and water.** *Ex. Can include using clay, drawing, diagram, etc.* **Level III Students will:** **Given a visual representation, communicate the difference between bodies of water and landforms.** *Ex. map, globe, pictures, etc.* **Level II Students will:** **Identify a body of water or a land form.** *Ex. Point to the picture of a lake when given the choice between a lake and a mountain.* **Level I Students will:** **Attend to activities that model representations of landforms and bodies of water.**
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid, liquid, or gas.	**SES-2-ESS2-3. Participate in a guided investigation and identify different states of matter (ice/solid, water/liquid, and steam/gas).**	**Level IV Students will:** **Participate in a guided investigation which demonstrates states of matter (ice/solid, water/liquid and steam/gas) and communicate the changes.** *Ex. Water being frozen and then boiled goes from ice/solid to water/liquid to steam/gas.* **Level III Students will:** **Participate in a guided investigation and identify different states of matter (ice/solid, water/liquid, and steam/gas).** **Level II Students will:** **Participate in a guided investigation which demonstrates states of matter (ice/solid, water/liquid, and steam/gas)** **Level I Students will:** **Attend to a guided investigation which demonstrates ice/solid, water/liquid, and steam/gas.**

K-2-ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Would you brush your teeth with a toothbrush or a screwdriver?* **Level II Students will:** **Match the tool to the use.** *Ex. toothbrush - teeth, screwdriver - screw, hammer – nail, etc.* **Level I Students will:** **Attend to activities that demonstrate tools being used to solve problems.**
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.** *Ex. Show how a spoon will work better than a fork to eat soup because it is rounded.* **Level III Students will:** **Identify the shape of an object and its function.** *Ex. A ball is round so it can roll.* *Ex: A tire is round so it can roll.* **Level II Students will:** **Match an object with a shape.** *Ex. A ball is a circle, a block and a square.* **Level I Students will:** **Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.**
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**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.** *Ex. Try to eat soup with a fork and a spoon and communicate the results.* *Ex. Compare shoes with laces to shoes with Velcro.* **Level III Students will:** **Identify the differences of two objects designed to solve the same problem.** *Ex. Discuss the differences between using a fork or a spoon to eat soup.* **Level II Students will:** **Match the tool to solve the given problem.** *Ex. Spoon with soup, fork with meat, Hammer with nail, screwdriver and screw, etc.* **Level I Students will:** **Attend to activities that compare two objects designed to solve the same problem.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.	**SES-3-PS2-1. Demonstrate how the direction, or speed, of an object will change due to an outside force.**	**Level IV Students will:** **Predict, and demonstrate, how the direction, or speed, of an object will change due to an outside force.** *Ex. Student states that if I push the toy car it will move forward.* **Level III Students will:** **Demonstrate how the direction, or speed, of an object will change due to an outside force.** *Ex. Pushes a toy car slowly; pushes a toy car quickly; turns a toy car, moves an object side to side, etc.* **Level II Students will:** **Apply appropriate forces that move, stop, or start an object in a given direction.** *Ex. Stops and starts a toy car.* **Level I Students will:** **Identify a force (push or pull) that changes the motion of an object.** *Ex. Teacher demonstrates pushing and pulling an object; presents pictures of pushing or pulling objects.*
3-PS2-2. 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 motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.	**SES-3-PS2-2. Make observations about the pattern(s) of an objects motion to predict future motion.**	**Level IV Students will:** **Make observations on an object's motion to provide evidence that a pattern can be used to predict future motion.** *Ex. Throw a ball into the air - student will predict the future motion.* **Level III Students will:** **Make observations about the pattern(s) of an object's motion to predict future motion.** *Ex. Shown a picture of an adult preparing to push a child in a swing - student predicts the motion produced by the push of the swing.* *Ex: The sun rising and setting* **Level II Students will:** **Describe a pattern of an object's motion.** *Ex. A bouncing ball goes up and down, a swing goes back and forth, etc.* **Level I Students will:** **Attend to activities that demonstrate an object's pattern of motion.** *Ex. Given a stationary object and object moving back and forth, student will observe an object's pattern of motion.*

PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. 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 affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.	**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.** *Ex. Student will ask, "Why does my hair stick to the balloon?"* **Level III Students will:** **Demonstrate the effects of a magnetic, or electric, interaction between two objects not in contact with each other.** *Ex. Student rubs a balloon on head to show static electricity.* *Ex. Student moves paper clips with magnets.* **Level II Students will:** **Explore magnetic, or electric, interactions between two objects not in contact with each other.** *Ex. Student will manipulate the magnet to show interaction.* **Level I Students will:** **Attend to the presence of magnetic or electric interactions between two objects not in contact with each other.** *Ex. Student attends to presentation of magnetic, or electric, interactions such as those listed above*.
3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets. Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.	**SES-3-PS2-4. Given a simple design problem, explore ways to solve the problem using magnets.**	**Level IV Students will:** **Given a simple design problem, communicate ways to solve the problem using magnets, and present the solution.** *Ex. When given two or more items and a magnet, student will investigate which items will be held to a surface with magnetic force, and communicate the solution.* **Level III Students will:** **Given a simple design problem, explore ways to solve the problem using magnets.** *Ex. Given two or more items such as a paper and pen with a magnet, student will investigate which items will be held to a surface with magnetic force.* **Level II Students will:** **Demonstrate how magnets can be used.** *Ex. Student will use magnets to stick to appropriate surface.* **Level I Students will:** **Attend to examples of how magnets can be used.** *Ex. Paper being held on the refrigerator by a magnet vs. paper laying on the floor.*

LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. Clarification Statement: Changes organisms go through during their life form a pattern.	**SES-3-LS1-1. Use a model to demonstrate the life cycle of an organism.**	**Level IV Students will:** **Create a model of a simple life cycle.** *Ex. egg, tadpole, frog; egg, chick, chicken; baby, youth, adult, etc.* **Level III Students will:** **Use a model to demonstrate the life cycle of an organism.** *Ex. Arrange pictures of a frog life cycle.* **Level II Students will:** **Identify two steps of the life cycle.** *Ex. Point to the picture of tadpole and an adult frog.* **Level I Students will:** **Attend to teacher arranging pictures of the life cycle.** *Ex. Frog life cycle*

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS2-1. Construct an argument that some animals form groups that help members survive.	**SES-3-LS2-1. Use a model to demonstrate that some animals form groups.**	**Level IV Students will:** **Create a model to demonstrate that some species of animals form groups and some do not.** *Ex. Given several animal figures, students manipulate and group.* **Level III Students will:** **Use a model to demonstrate that some animals form groups.** *Ex. point to pictures of antelope, bison, mountain lions, bears, etc.* **Level II Students will:** **Recognize groups of animals vs. individual animals.** *Ex. individual antelope vs herd of antelope* **Level I Students will:** **Attend to pictures of different groups of animals.** *Ex. individual antelope vs. herd of antelope*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS3 – Heredity: Inheritance and Variation of Traits

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Student is asked to find, or state, an example of offspring that resemble their parents but have variations such as: eye color, fur color, size, etc.* **Level III Students will:** **Use evidence to show how offspring inherit physical traits that resemble those of their parents.** *Ex. Teacher provides several pictures of a bear and a cub, a cat and a kitten, etc. and students identify the physical feature(s) that the adult and offspring share.* **Level II Students will:** **Match offspring that resemble their parents.** *Ex. Match a baby chick with a chicken.* **Level I Students will:** **Attend to teacher matching offspring to parent.** *Ex. Teacher matches pictures of different species, offspring to parents.*
3-LS3-2. Use evidence to support the explanation that observable traits can be influenced by the environment. Clarification Statement: Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, and amount of exercise an animal gets, chemicals in the water) may influence organisms' observable traits.	**SES-3-LS3-2. Make observations about how an organism's observable traits can be influenced by the environment.**	**Level IV Students will:** **Communicate how an organism's observable traits have been affected by the environment.** *Ex. Given pictures of animals, choose one to demonstrate the concept.* **Level III Students will:** **Make observations about how an organism's observable traits can be influenced by the environment.** *Ex. Picture of rabbit in winter and rabbit in summer (color of fur).* **Level II Students will:** **Identify pictures of how an organism's observable traits can be influenced by the environment.** *Ex. Student matches pictures of organisms to environment such as a white rabbit to snowy environment, etc.* **Level I Students will:** **Attend to teacher presentation about how observable traits can be influenced by the environment.**

LS4 – Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.	**SES-3-LS4-1. Identify fossils as the remains of plants and animals that lived long ago.**	**Level IV Students will:** **Using data from fossils, describe the environment the organism may have lived in long ago.** *Ex. Fossils of marine life are found where there once was water.* **Level III Students will:** **Identify fossils as the remains of plants and animals that lived long ago.** *Ex. Students can press leaves into soft playdough to leave an impression. The leaf will die but the impression will remain.* **Level II Students will:** **Recognize a fossil.** *Ex. Given a rock and a fossil, student will recognize the fossil.* *EX. Hide fossils in a sand box and have students dig for them.* **Level I Students will:** **Attend to information presented about fossils.** *Ex. The book "Curious About Fossils" by Kate Waters explains why and where fossils form and looks at the colorful lives and important discoveries of some of the great early fossil hunters and collectors.*
3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.	**SES-3-LS4-2. Use models to identify characteristics that help organisms survive.**	**Level IV Students will:** **Make a model that demonstrates how the characteristics of an organism help the organism survive.** **Level III Students will:** **Use models to identify characteristics that help organisms survive.** *Ex. Identify thorns on a rose as a survival characteristic, camouflage of animals.* **Level II Students will:** **Match pictures of characteristics that help organisms survive.** *Ex. picture of rose and thorn, teeth and lion, etc.* **Level I Students will:** **Attend to presentation of characteristics which help organisms survive.**

LS4 – Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. Clarification Statement: Examples of evidence could include needs and traits of the organisms and characteristics of the habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.	**SES-3-LS4-3. Determine whether or not an organism is able to survive in a given environment.**	**Level IV Students will:** **Use evidence to determine that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** *Ex. pictures of fish in a desert; palm tree in the arctic, etc.* **Level III Students will:** **Determine whether or not an organism is able to survive in a given environment.** *Ex. Match multiple pictures of organisms to environments.* **Level II Students will:** **Match an organism to their environment.** *Ex. Match a picture of an animal to its environment, or vice versa.* **Level I Students will:** **Attend to presentation of matching organisms to their environment.**
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.** *Ex. Animals will evacuate area during a forest fire.* **Level II Students will:** **Identify major environmental changes.** *Ex. pictures of campfire vs. forest fire; pictures of major flood, clear cut forest, etc.* **Level I Students will:** **Attend to a presentation of pictures of major environmental changes.**

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.	**SES-3-ESS2-1. Use a model to communicate typical weather conditions expected during a particular season.**	**Level IV Students will:** **Make a model that communicates typical weather conditions expected during a particular season.** *Ex. Draw a picture of winter.* **Level III Students will:** **Use a model to communicate typical weather conditions expected during a particular season.** *Ex. Given a variety of weather conditions, student will communicate the correct season.* **Level II Students will:** **Match weather conditions to corresponding season.** *Ex. Match picture of snow to winter.* **Level I Students will:** **Attend to a presentation of weather conditions and their corresponding season.**
3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.	**SES-3-ESS2-2. Describe the local climate.**	**Level IV Students will:** **Compare local climate to the climate of another region.** *Ex. Compare Cheyenne to Maui.* **Level III Students will:** **Describe the local climate.** **Level II Students will:** **Select appropriate representations of the local climate.** *Ex. Select pictures representing local climate.* *Ex. Wyoming is windy, dry, snows in winter, etc.* **Level I Students will:** **Attend to a presentation about the local climate.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.	**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.** *Ex. Draw a picture of a snow-fence around their school or home.* **Level III Students will:** **Communicate a solution that reduces the impacts of weather.** *Ex. Given a weather condition, provide a solution (coat for cold).* **Level II Students will:** **Match a solution that reduces the impact of weather.** *Ex. match umbrella to rain, match coat to cold weather, etc.* **Level I Students will:** **Attend to a presentation of solutions that reduce the impact of weather.**

3-5 ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Create a pollinator by selecting from a variety of materials such as cotton balls, q tips, pipe cleaners, rubber bands, paper, etc.* **Level II Students will:** **Match the appropriate materials for a project given a list of possible materials to complete a simple design problem.** *Ex. Matching scissors to cut paper, tape or glue to adhere materials together.* **Level I Students will:** **Attend to activities that demonstrate finding a solution to a simple design problem.**
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.** *Ex. Given images of different scenarios, student chooses the best solution.* **Level I Students will:** **Attend to activities that compare possible solutions to a problem.**
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.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.	**SES-4-PS3-1. Demonstrate how the speed of an object is related to the energy of the object.**	**Level IV Students will:** **Construct an explanation to demonstrate how the higher speed of an object is related to the higher energy of that object.** *Ex. Demonstrate and explain how pushing toy car with a light push, vs. pushing a toy car with hard push, affects the speed the toy car travels.* **Level III Students will:** **Demonstrate how the speed of an object is related to the energy of the object.** *Ex. Student will show how pushing toy car with a light push, vs. pushing a toy car with hard push, affects the speed the toy car travels.* **Level II Students will:** **Identify example(s) that show how the energy of an object affects the speed of the object.** *Ex. Student will identify the object exhibiting greater energy and speed, from an adult pushing a toy car with a light push, vs. pushing a toy car with hard push.* **Level I Students will:** **Attend to a presentation of an object exhibiting greater energy and thus greater speed.** *Ex. Student will attend to demonstration of pushing toy car with a light push vs. pushing a toy car with hard push.*
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	**SES-4-PS3-2. Make observations to describe that heat energy can be transferred from place to place.**	**Level IV Students will:** **Make observations to provide evidence that heat energy can be transferred from place to place.** *Ex. Student explains that campfire is a source of heat that can warm hands, cook marshmallow, warm area around fire, etc.* **Level III Students will:** **Make observations to describe that heat energy can be transferred from place to place.** *Ex. Given a picture of a campfire, someone roasting a marshmallow and someone warming their hands, student will state observations about the transfer of heat occurring in the picture.* **Level II Students will:** **Identify hot and cold items.** *Ex. Given a heating pad and ice pack, students will identify which is hot and which is cold.* **Level I Students will:** **Attend to a presentation that heat energy can be transferred from place to place.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.	**SES-4-PS3-3. Demonstrate how a change in energy occurs when objects collide.**	**Level IV Students will:** **Predict, and demonstrate, how the speed of an object will change the energy of a collision.** *Ex. Student states if the cars are moving faster, then there will be a bigger collision, then precedes to demonstrate with toy cars.* **Level III Students will:** **Demonstrate how a change in energy occurs when objects collide.** *Ex. As a result of change in speed, a change of energy occurs when objects collide.* *Ex. Cause two cars to crash moving towards each other at a slow speed, then cause a collision using a faster toy speed.* **Level II Students will:** **Apply appropriate forces that move, stop, or start an object by collision.** *Ex. Stops and starts toy cars by collision.* **Level I Students will:** **Attend to the collision of objects.** *Ex. Student observes a demonstration of a collision with toy cars.*
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 that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.	**SES-4-PS3-4. Identify devices that use different types of energy.**	**Level IV Students will:** **Create a device that uses energy.** *Ex. pinwheel, solar oven Pringles can, catapult, pulley, marble run, puff mobile, etc.* **Level III Students will:** **Identify devices that use different types of energy** *Ex. flash light, lamp, refrigerator, toys, electronic devices, etc.* **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.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex: Make two different wave shapes.* *Ex: Move a rope faster vs slower; taller or shorter, etc.* *Ex. Slinky movements* **Level III Students will:** **Use a model to show what a wave looks like.** *Ex. Draw a picture of a wave shape.* *Ex: Move a rope back and forth to model a wave.* *Ex: Student moves water in a tub to make waves; moves a rope up and down, etc.* **Level II Students will:** **Identify a wave.** **Level I Students will:** **Attend to a demonstration of wave movement.** *Ex. Water is moved in a tub to make waves.*
4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	**SES-4-PS4-2. Use a model to demonstrate that light reflects from some objects.**	**Level IV Students will:** **Describe/communicate ways that some objects reflect light.** *Ex. Student communicates that a mirror reflects light while cardboard does not.* **Level III Students will:** **Use a model to demonstrate that light reflects from some objects.** *Ex. Student shows that a mirror can reflect light.* **Level II Students will:** **Explore ways to reflect light off of different objects.** *Ex. Student uses flashlight and objects to see what reflects light.* **Level I Students will:** **Attend to demonstration of light reflecting off an object.** *Ex. Teacher uses flashlight and mirror to reflect light.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Student will clap three times to get a drink of water.* **Level III Students will:** **Use a method to send or receive information.** *Ex. Student will tap a drum once to start, twice to stop.* **Level II Students will:** **Respond to the signal of transfer of information.** *Ex. Student starts and stops according teacher signal with drum.* **Level I Students will:** **Attend to the teacher modeling a transfer of information.** *Ex. A drum, buzzer, bell, etc. is used to signal start and stop.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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, stomach, lung, brain, and skin.	**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.** *Ex. Draw a picture of an organism, identifying structure(s) that help the organism to survive.* **Level III Students will:** **Use a model to demonstrate that plants and animals have structures that support their survival.** *Ex. Given a picture, ask student what parts of a plant (or animal) helps it survive.* **Level II Students will:** **Match structures for survival to an organism.** *Ex. leaves to a plant, thorns to a plant, feathers to a bird, etc.* **Level I Students will:** **Attend to a demonstration of plant and animal structures that support their survival.** *Ex. Pictures of leaves on a plant, fur on an animal, etc.*
4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. Clarification Statement: Emphasis is on systems of information transfer.	**SES-4-LS1-2. Use a model to describe that animals respond to different types of stimuli.**	**Level IV Students will:** **Use a model to describe that animals receive different types of information, through their senses, to their brain.** *Ex. Sequence pictures of how sound travels from the ear to the brain.* **Level III Students will:** **Use a model to describe that animals respond different types of stimuli.** *Ex. A snake feels vibrations through its skin; a hawk sees prey with its eyes; dogs hear a car passing by; etc.* **Level II Students will:** **Match different senses to the receptor organ.** *Ex. Match pictures of sound to ear, light to eyes, etc.* **Level I Students will:** **Attend to a presentation of different senses matched to receptor organ.**

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Use a picture of river eroding the landscape, videos of lava flowing from volcanoes, etc.* **Level III Students will:** **Describe that landscapes can change.** *Ex. Use pictures of a volcano blowing up, land slide, tsunami, etc.* **Level II Students will:** **Make observations of landscape differences.** *Ex. Compare pictures of different landscapes.* **Level I Students will:** **Attend to a presentation of landscapes.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.	**SES-4-ESS2-1. Use a model to describe an erosion event.**	**Level IV Students will:** **Model an erosion event.** *Ex. Use a stream table, pan of sand, drawing, or other materials to model an erosion event, etc.* **Level III Students will:** **Use a model to describe an erosion event.** *Ex. Use a stream table, pan of sand, or other materials to describe an erosion event.* **Level II Students will:** **Explore how water and wind cause erosion.** *Ex. Use a stream table, pan of sand, or other materials to explore erosion event.* **Level I Students will:** **Attend to a demonstration of erosion by water or wind.**
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features. Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.	**SES-4-ESS2-2. Recognize different kinds of information, from maps, that describe Earth's features.**	**Level IV Students will:** **Create a model that shows different map features.** *Ex. Create a map (out of clay, paper, craft materials, etc.) that shows mountains.* **Level III Students will:** **Recognize different kinds of information, from maps, that describe Earth's features.** *Ex. Using a map, point to different features (mountains, lake, ocean, etc.)* **Level II Students will:** **Identify a feature on a map.** *Ex. mountain on a 3-D map* **Level I Students will:** **Attend to a presentation of map features.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment. Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources could include fossil fuels and fissile materials.	**SES-4-ESS3-1. Describe different types of energy resources.**	**Level IV Students will:** **Describe/communicate how energy resources are used.** *Ex. Use pictures/videos of energy resources such as wind, water, sunlight, etc.* **Level III Students will:** **Describe different types of energy resources.** *Ex. Use pictures/videos of energy resources such as wind, water, sunlight, etc.* **Level II Students will:** **Identify energy resources.** *Ex. Use pictures/videos of energy resources such as wind, water, sunlight, etc.* **Level I Students will:** **Attend to a presentation of examples of energy resources.**
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.	**SES-4-ESS3-2. Recognize the impacts of natural Earth processes on humans.**	**Level IV Students will:** **Describe how humans prepare for a potential impact of a natural Earth process.** *Ex. Use pictures/videos/drawings of hail, thunderstorms, flooding, etc.* **Level III Students will:** **Recognize the impacts of natural Earth processes on humans.** *Ex. Match pictures of Earth process to its impact on humans, such as a fire that destroys a home, a flood that covers neighborhoods, hail that dented a car, etc.* **Level II Students will:** **Identify natural Earth processes.** *Ex. Use pictures/videos of hail, thunderstorms, flooding, etc.* **Level I Students will:** **Attend to a presentation of natural Earth processes.** *Ex. Show pictures/videos of hail, thunderstorms, flooding, etc.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

3-5 ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Create a pollinator by selecting from a variety of materials such as cotton balls,Q- tips, pipe cleaners, rubber bands, paper, etc.* **Level II Students will:** **Match the appropriate materials for a project given a list of possible materials to complete a simple design problem.** *Ex. Matching scissors to cut paper, tape or glue to adhere materials together.* **Level I Students will:** **Attend to activities that demonstrate finding a solution to a simple design problem.**
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.** *Ex. Given images of different scenarios, student chooses the best solution.* **Level I Students will:** **Attend to activities that compare possible solutions to a problem.**
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.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.	**SES-5-PS1-1. Use a model to describe that matter is made of smaller particles.**	**Level IV Students will:** **Describe one or more examples of objects made of smaller parts.** *Ex. Student draws an object made of smaller parts.* **Level III Students will:** **Use a model to describe that matter is made of smaller particles.** *Ex. Given a rice crispy treat communicate how it is made of smaller parts.* **Level II Students will:** **Identify objects made from smaller parts.** *Ex. Student will choose between two pictures such as bricks to make a house, etc.* **Level I Students will:** **Attend to a demonstration of objects made of smaller parts.** *Ex. Crumbling a sugar cube; taking apart Legos, or deconstructing a block wall, etc.*
5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.	**SES-5-PS1-2. Demonstrate that a solid that melts has the same mass in its liquid form.**	**Level IV Students will:** **Measure quantities to provide evidence that a solid that melts has the same mass in its liquid form.** *Ex. Student provides evidence that when the same mass of ice on both sides of a balance scale, after melting one side, has the same mass as the other side.* **Level III Students will:** **Demonstrate that a solid that melts has the same mass in its liquid form.** *Ex. Using the same mass of ice on both sides of a balance scale, after melting one side, show that it has the same mass.* *Ex. An ice cube on a scale, then later the same ice cube on a scale (after it has melted).* **Level II Students will:** **Assist in balancing objects on a double-pan balance scale.** *Ex. balancing blocks, etc.* **Level I Students will:** **Attend to demonstration of balancing objects on a double-pan balance scale.** *Ex. Teacher balances the mass of a block.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS1-3. Make observations and measurements to identify materials based on their properties. Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, luster, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.	**SES-5-PS1-3. Make observations to identify materials based on their properties.**	**Level IV Students will:** **Compare objects by organizing them according to their properties.** *Ex. Sort objects according to taste, color, texture, etc.* **Level III Students will:** **Make observations to identify materials based on their properties.** *Ex. Salt and sugar to be identified by taste, salt and pepper by color, vinegar and water by smell, sand paper and copy paper by touch.* **Level II Students will:** **Identify properties of materials.** *Ex. Teacher asks which one is soft, hard, sweet, sour, etc.* **Level I Students will:** **Explore different properties of materials.** *Ex. Taste the salt, feel the fur, smell the vinegar, etc.*
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.** *Ex. Student will mix vinegar and baking soda and mix water and baking soda; the student determines which mixture resulted in a new substance by its properties.* **Level III Students will:** **Determine whether mixing two substances results in a new substance.** *Ex. Present an array of pictures with some having a new substance produced and others not having a new substance produced.* *Ex. Present demonstrations of chemical vs. physical reactions.* **Level II Students will:** **Observe, and determine, which two substances, when mixed, results in a new substance.** *Ex. Teacher will mix a sugar cube in water and Alka-Seltzer in water; student will express which two substances, when mixed, resulted in a new substance (Alka-Seltzer produces a new substance, gas).* **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.** *Ex. Mix Alka-Seltzer with water and mix salt in water.*

PS2 - Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.	**SES-5-PS2-1. Demonstrate that gravity pulls an object to the Earth.**	**Level IV Students will:** **Describe that gravity pulls objects to the Earth.** *Ex. Student communicates what is pulling the object.* **Level III Students will:** **Demonstrate that gravity pulls an object to the Earth.** *Ex. Student drops a ball.* **Level II Students will:** **Explore gravity by dropping different objects.** *Ex. Student drops several objects.* **Level I Students will:** **Attend to others dropping objects to demonstrate gravity.** *Ex. Teacher drops several objects.*

PS3 - Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Using a picture of an animal eating the plant, student will communicate that the energy transfers from plant to animal.* **Level III Students will:** **Use models to describe that plants capture energy from sunlight.** *Ex. Use a plant or picture of a plant to communicate that a plant's energy comes from the sun.* **Level II Students will:** **Identify that plants need sunlight to grow.** *Ex. Given plants or pictures of plants in light and dark, student will identify those in light.* **Level I Students will:** **Attend to pictures of plants with the sun and pictures of plants without sun.** *Ex. Picture of a plant in light and a picture of a plant in dark (plant in dark should be dying).*

LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-LS1-1. Support an argument that plants get the materials they need for growth primarily from air and water. Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.	**SES-5-LS1-1. Participate in an experiment to determine what happens when plants do not have water or air.**	**Level IV Students will:** **Design and conduct an experiment to determine what happens when plants do not have water or air.** *Ex. Grow plants in different conditions to determine what happens, in an open bag and in a closed bag, with and without water, etc.* **Level III Students will:** **Participate in an experiment to determine what happens when plants do not have water or air.** **Level II Students will:** **Identify that plants need water and air.** *Ex. The students will identify pictures of healthy plants vs. pictures of dying plants along with which ones received/did not receive water and air.* **Level I Students will:** **Attend to a presentation of what happens when plants do not have water or air.** *Ex. Presentation of pictures of plants being watered/getting air, looking healthy. A presentation of plants not being watered/not getting air, looking unhealthy.*

LS2 - Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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, ecosystems, and the Earth.	**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.** *Ex. Draw an example of a food chain.* **Level III Students will:** **Use a model to describe a food chain with multiple organisms.** *Ex. Given pictures the student puts diagrams in the correct order to form a food chain.* **Level II Students will:** **Match the organism to the matter that is associated with the organism in the food chain.** *Ex. grass to cow, worm to bird, mouse to hawk, etc.* **Level I Students will:** **Attend to a presentation of a food chain with multiple organisms.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	**SES-5-ESS1-1. Identify the relationship between apparent brightness and relative distance.**	**Level IV Students will:** **Use a model to describe differences in apparent brightness due to relative distances.** *Ex. Student will demonstrate by using a model, like one flashlight being closer and one further away, to describe that the closer flashlight appears brighter.* **Level III Students will:** **Identify the relationship between apparent brightness and relative distance.** *Ex. Use a model, such as one flashlight being closer and one further away.* *Ex: Headlights on a car appear to get brighter as the car gets closer.* *Ex: The sun appears brighter than other stars because Earth is closer to the sun than it is to other stars.* **Level II Students will:** **Explore the difference in apparent brightness due to relative distances.** *Ex. Use a model like one flashlight being closer and one further away.* **Level I Students will:** **Attend to a demonstration using a model to compare differences in apparent brightness due to their relative distances.** *Ex. Use a model like one flashlight being closer and one further away.*
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.** *Ex. Moving a flashlight around an object to show shadow changes.* *Ex: Drawings/outlines of shadows at different times of day.* **Level III Students will:** **Investigate changes in shadows and/or daily changes in day and night.** *Ex: Outline shadows on butcher paper at different times of day.* *Ex: Use a flashlight to produce shadows.* **Level II Students will:** **Observe changes in shadows and/or daily changes in day and night.** *Ex. Students can match a sequence of pictures to show how shadows change throughout the day.* **Level I Students will:** **Attend to a demonstration that shows changes in shadows and/or daily changes in day and night.** *Ex. Teacher utilization of video (or other media) of how shadows change throughout the day.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS 2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.	**SES-5-ESS2-1. Given a model, show how one of Earth's spheres (geosphere, biosphere, hydrosphere, and/or atmosphere) interacts with another sphere.**	**Level IV Students will:** **Use a model to describe how one of Earth's spheres (geosphere, biosphere, hydrosphere, and/or atmosphere) interacts with another sphere.** *Ex. Draw or find pictures of a river running over the Earth, an animal drinking water out of a river.* **Level III Students will:** **Given a model, show how one of Earth's spheres (geosphere, biosphere, hydrosphere, and/or atmosphere) interacts with another sphere.** *Ex. Given an example (pictures/videos/other media) of a river running over the Earth, an animal drinking water out of a river, person breathing air, students indicate which spheres are interacting.* **Level II Students will:** **Identify each of the Earth's spheres (geosphere, biosphere, hydrosphere, and atmosphere).** *Ex. Students identify Earth's spheres through pictures or other media.* **Level I Students will:** **Attend to presentation of each of the Earth's spheres (geosphere, biosphere, hydrosphere, and atmosphere).** *Ex. Show pictures or other media to show examples of each of the four spheres.*
5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	**SES-5-ESS2-2. Identify the types of bodies of water by amounts and distribution of water on Earth.**	**Level IV Students will:** **Describe that different bodies of water contain different amounts of water.** *Ex. Compare two bodies of water by amount of water (ocean holds more water than a pond).* *Ex: Identify qualitative amounts of water, in different bodies of water.* **Level III Students will:** **Identify the types of bodies of water by amounts and distribution of water on Earth.** *Ex: Identify bodies of water by amounts of water (oceans, lakes, ponds, puddles).* **Level II Students will:** **Identify the difference between land and water.** *Ex. Students identify difference between land and bodies of water through pictures or other media.* **Level I Students will:** **Attend to presentation of different bodies of water.** *Ex. Show pictures, or use other media, to show examples of different bodies of water (lake, ocean, river, pond, puddle).*

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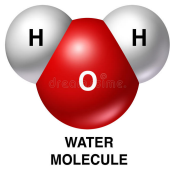
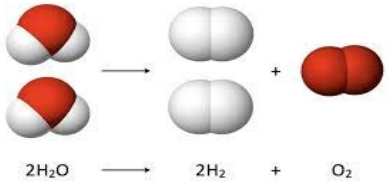
ESS 3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Refilling my water bottle saves me money, is convenient, reduces trash, etc.* **Level III Students will:** **Describe a way to reuse or recycle a resource.** *Ex. Use a cardboard box to make a fort, place empty plastic bottle in a recycle bin.* **Level II Students will:** **Explore ways to reuse or recycle a resource.** *Ex. Teacher led brainstorming about ways to reuse or recycle a pop bottle.* **Level I Students will:** **Attend to others reusing or recycling a resource.** *Ex. Throw scratch paper into recycle bin, refilling a water bottle.*

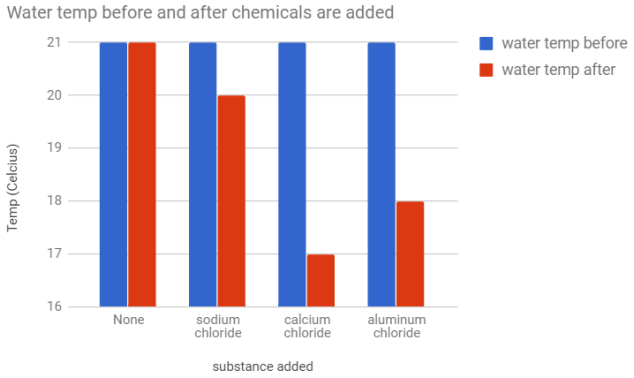
3-5 ETS1 - Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Create a pollinator by selecting from a variety of materials such as cotton balls, q tips, pipe cleaners, rubber bands, paper, etc.* **Level II Students will:** **Match the appropriate materials for a project given a list of possible materials to complete a simple design problem.** *Ex. Matching scissors to cut paper, tape or glue to adhere materials together.* **Level I Students will:** **Attend to activities that demonstrate finding a solution to a simple design problem.**
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.** *Ex. Given images of different scenarios, student chooses the best solution.* **Level I Students will:** **Attend to activities that compare possible solutions to a problem.**
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.**

PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Student creates a 3-dimensional model of a molecule that is based on a provided diagram. (Example of a simple molecule could be H_2O.) Student may provide various materials to select from such as Legos, craft materials, etc.*  *(Photo from: www.dreamtine.com))* *Ex. Based on the provided diagram, student creates a visual representation of a common chemical molecule.*  *Photo from JSquish* **Level III Students will:** **Model how simple parts can be put together to make more complex structures.** *Ex. Combine individual Lego pieces to assemble a more complex object.* *Ex. ball and stick models* *Ex. Student engages with items such as manipulatives.* **Level II Students will:** **Select two common objects that can be combined to make a familiar, complex structure.** *Ex. Select between cereal, milk, tennis shoes, toothbrush and a frog to identify which objects can be combined for breakfast.* *Ex. Select ingredients to make a sandwich.* **Level I Students will:** **Attend to lessons modeling simple parts being put together to make complex structures.**

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.	**SES-MS-PS1-2. Make observations of substances interacting to determine if a chemical reaction has occurred.**	**Level IV Students will:** **Analyze data to determine if a chemical reaction has occurred.** *Ex. Analyze a data (table or graph) showing water temperature before and after various substances are added. Students could be asked to select the data that shows a chemical change has occurred.*  *(Graph designed by: Sharla Dowding)* **Level III Students will:** **Make observations of substances interacting to determine if a chemical reaction has occurred.** *Ex. Alka-Seltzer tablet interacts with various substances. Students analyze the reaction to determine if a chemical reaction took place. (Looking for the presence of gas produced as an indicator of a chemical reaction)* *Ex. Burning match (chemical change) vs ice melting (physical change).* *Ex. Burning paper (chemical change) vs folding paper (physical change).* **Level II Students will:** **Identify changes in objects.** *Ex. Students view a set of "after" pictures and identify which one is different than the "before" picture.* **Level I Students will:** **Attend to multiple chemical reactions.** *Ex. Student attends to a video, or demonstration, of chemical reactions.*

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels. Wyoming examples could include, but are not limited to, changing oil into plastic or fibers, trona into synthetic rubber, etc.	**SES-MS-PS1-3. Distinguish between natural and synthetic materials.**	**Level IV Students will:** **Demonstrate understanding that some synthetic materials are made from natural materials.** *Ex. Coal is changed into energy.* *Ex. Plastic and fibers come from oil.* *Ex. Make homemade glue from milk. (simple recipes can be found online)* **Level III Students will:** **Distinguish between natural and synthetic materials.** *Ex. Identify a tree as natural and a plastic water bottle as synthetic.* **Level II Students will:** **Identify an object that can be found in nature.** *Ex. Present students with multiple objects. The students identify which objects are natural.* **Level I Students will:** **Engage with intentional examples of natural and synthetic materials.** *Ex. Feeling grass and feeling carpet.*
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 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.	**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.** *Ex. Describe water in various scenarios and ask student to predict what state of matter the water will be.* **Level III Students will:** **Describe the relationship between changes in temperature, kinetic energy, and changes in states of matter for water.** *Ex. Ice is colder and has less kinetic energy than liquid water. Steam is warmer and has more kinetic energy than liquid water.* **Level II Students will:** **Identify a state of matter for water.** *Ex. Student can identify a state of matter for water (solid, liquid or gas) from examples or from a group of pictures.* **Level I Students will:** **Engage with solids and liquids.** *Ex. Students could interact with ice cubes and liquid water.*

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Utilize PhET Balancing Reactions or Reactants, Products, & Leftovers animations/demonstrations can be found here Link to interactive simulations* **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.** *Ex. Making borax slime, or from Elmer's glue & contact solution.* **Level II Students will:** **Indicate the number of objects that are put into a container is the same number that can be taken out.** *Ex. One ball is placed in a clear container. Student can express that only one ball comes back out of the container.* **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-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.	**SES-MS-PS1-6.** **Participate in a design project to keep thermal energy in a substance or container.** **(SES-MS-PS3-3 is included in this extended standard.)**	**Level IV Students will:** **Compare two different material choices for keeping thermal energy in a system.** *Ex. Students use a digital thermometer to measure the temperature of an uninsulated container and compare it to a container with insulation chosen by the student.* **Level III Students will:** **Participate in a design project to keep thermal energy in a substance or container.** *Ex. Wrap a bottle of hot water in a hat, mittens, or other options that they select.* **Level II Students will:** **Select an item that can prevent thermal energy transfer.** *Ex. Hot mitt keeps heat out when grabbing a hot object.* *Ex. Coat keeps heat inside.* **Level I Students will:** **Engage with something warm.** *Ex. Hold or touch a heating pad, hand warmers, or warm rice bag.*

PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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).** *Ex. Predict which direction a car with less mass will travel after a collision with a car of greater mass.* **Level III Students will:** **Investigate, and describe, the direction of motion of two colliding objects of equal and unequal masses.** *Ex. Describes the direction of motion of the car with less mass after a collision with a car of greater mass.* **Level II Students will:** **Produce collisions between two objects of equal and of unequal masses.** *Ex. Use toy cars to create a variety of collisions, stationary and moving.* *Ex. Direct someone else to create collisions between objects.* **Level I Students will:** **Observe collisions between two objects.** *Ex. View collisions between two objects (of equal and unequal masses) in the classroom or on video.*
MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. 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.	**SES-MS-PS2-2 is incorporated into SES-MS- PS2-1 by including equal and unequal mass.**	**Not Applicable.**

PS2 – Motion and Stability: Forces and Interactions (cont.)

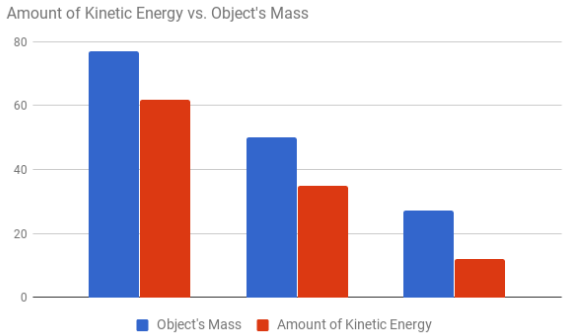
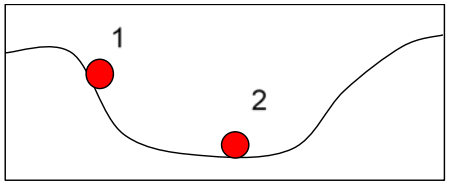
2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.	**SES-MS-PS2-3. Ask questions about the strength of magnetic forces.**	**Level IV Students will:** **Ask and investigate how magnetic forces can be changed.** *Ex. Students investigate how distance, size, or numbers of magnets affect the force between them.* **Level III Students will:** **Ask questions about the strength of magnetic forces.** *Ex. Students wonder how distance, size, or numbers of magnets affect the force between them.* **Level II Students will:** **Play with magnets.** **Level I Students will:** **Attend to interactions between magnets.** Teacher note: Magnets can be placed in larger items to make it easier for students with limited dexterity. Magnets can also be attached to gloves and then the gloves placed on the student.
MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the sun, and orbital periods of objects within the solar system.	**SES-MS-PS2-4. Use surroundings and information provided to predict the effects of gravity.**	**Level IV Students will:** **Provide evidence to support the claim that all objects are effected by gravity.** *Ex. Student generated example of gravity acting on an object.* **Level III Students will:** **Use surroundings and information provided to predict the effects of gravity.** *Ex. Show students pictures of a ball on the floor, on a table, and above the table. Students must select which picture shows the effect gravity will have on the ball when pushed off the table.* **Level II Students will:** **Compare the effects of gravity on different items in the classroom.** *Ex. Flat paper, crumpled paper, soccer ball, feathers, etc.* **Level I Students will:** **Attend to an item being dropped.**

PS2 – Motion and Stability: Forces and Interactions (cont.)

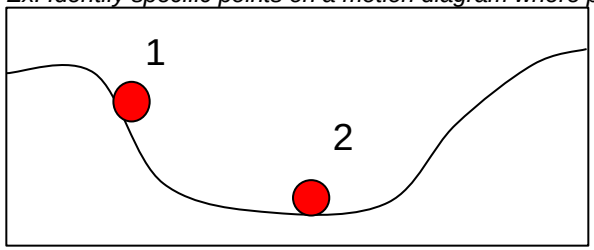
2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.	**SES-MS-PS2-5. Investigate an object that has a static charge.**	**Level IV Students will:** **Investigate the effects of increasing the static charge on an object.** *Ex. Student tries to make the greatest number of balloons stick together using static applied with a cloth or a material chosen by the student.* **Level III Students will:** **Investigate an object that has a static charge.** *Ex. Student investigates that two balloons with static will repel whereas a balloon with static and a balloon without static will attract.* **Level II Students will:** **Apply a static charge to an object, or tell someone how to apply the static charge.** *Ex. Charge a comb and touch to hair.* **Level I Students will:** **Attend to an object that has a static charge.** *Ex. A balloon charged with static will stick to a wall*.

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include: riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a whiffle ball versus a tennis ball.	**SES-MS-PS3-1. Identify changes in kinetic energy on a labeled diagram.**	**Level IV Students will:** **Identify changes in kinetic energy by analyzing a bar graph.** *Ex. The blue bar represents an object's mass and the red bar represents the amount of kinetic energy.*  *(Graph designed by: Trenton Vonburg)* **Level III Students will:** **Identify changes in kinetic energy on a labeled diagram.** *Ex. Identify specific points on a motion diagram where kinetic energy is increasing or decreasing.*  *(Diagram designed by: Jessica DeFreece)* **Level II Students will:** **Experience changes in speed.** *Ex. Rolling objects down a ramp, on a flat surface, or up a slope.* **Level I Students will:** **Attend to a lesson about kinetic energy.** *Ex. Picture or video of a roller coaster.* *Ex. Ball rolling down a ramp.*

PS3 – Energy (cont.)

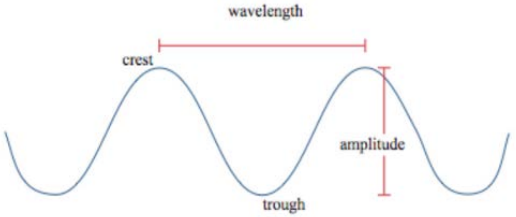
2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. Clarification 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.** *Ex. skateboard on a hill, a book held above your head, etc.* **Level III Students will:** **Identify differing amounts of potential energy on a labeled diagram.** *Ex. Identify specific points on a motion diagram where potential energy is increasing or decreasing.*  *(Diagram designed by Jessica DeFreece)* **Level II Students will:** **Participate in a discussion about position and potential energy.** *Ex. Book at varying heights on a bookshelf.* *Ex. Roller coaster at varying positions on a hill.* *Ex. Student on a swing.* **Level I Students will:** **Attend to a lesson about potential energy.**
MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. Clarification Statement: Examples of devices could include an insulated box, a natural system (e.g., a compost bin), a solar cooker, and a Styrofoam cup.	**SES-MS-PS3-3 is Incorporated into SES-MS-PS1-6.**	**Not Applicable.**

PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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. Is incorporated into SES-MS-PS1-4.**	**Not Applicable.**
MS-PS3-5. Construct, use, and present arguments 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 used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.	**SES-MS-PS3-5. Demonstrate how kinetic energy is transferred between objects.**	**Level IV Students will:** **Design their own demonstration to support the claim that energy can be transferred from one object to another.** *Ex. Students select materials to show how energy is transferred.* **Level III Students will:** **Demonstrate how kinetic energy is transferred between objects.** *Ex. This could be as simple as placing warmed hands on a desk and feeling the difference between the warmed spot and the remaining cold desk.* *Ex. Use a Newton's cradle to demonstrate transfer of kinetic energy.* **Level II Students will:** **Identify common objects that will transfer energy to them.** *Ex. A hot slide, or a picture of a pan on a stove, could be selected as objects that can transfer energy to them.* **Level I Students will:** **Attend to a demonstration of transfer of kinetic energy.** *Ex. Students watch a demonstration of one object being used to heat another object.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** Ex.  *(Photo from: Geoff Ruth)* **Level II Students will:** **Select the larger amplitude of two wave patterns.** **Level I Students will:** **Attend to a diagram of waves.** *Ex. Student traces a wave pattern with their fingers or their eyes.*
MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. Clarification Statement: Emphasis is on both electromagnetic and mechanical waves. Examples of models could include: drawings, simulations, and written descriptions.	**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:** **Describe how light waves behave when interacting with various materials.** *Ex. Students can reflect light with mirrors.* *Ex. Students shine light on black fabric and white fabric to observe absorption.* **Level II Students will:** **Observe a laser light interacting with different liquids.** *Ex. Shine laser light on a container while pouring the liquid into a different container. Good liquids include milk, water, or cooking oil.* **Level I Students will:** **Observe light being reflected.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in Wi-Fi devices, and conversion of stored binary patterns to make sound or text on a computer screen.	**SES-MS-PS4-3. Select an electronic means and a non-digital means of sending information.**	**Level IV Students will:** **Evaluate different ways to send information.** **Level III Students will:** **Select an electronic means and a non-digital means of sending information.** *Ex. Electronic examples may include email, text, assistive communication device, etc.* *Ex. Non-digital examples include handwriting on the board, written letter, or note.* **Level II Students will:** **Identify methods that people use to communicate.** **Level I Students will:** **Attend to demonstrations of different ways to send information.** *Ex. music on the radio, images, text, or symbols*

LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.	**SES-MS-LS1-1. Identify the difference between living and nonliving things.**	**Level IV Students will:** **Discuss what living things need/can do, and why non-living things are non-living.** *Ex. Birds are living because they move, breathe, eat, etc. Rocks are not living because they do not need to eat, move, etc.* **Level III Students will:** **Identify differences between a living and non-living thing.** *Ex. Can defend their choices for living things or non-living things when given a picture and asked to classify objects.* **Level II Students will:** **Classify objects as living or non-living.** *Ex. Given a picture the student can classify multiple objects within a picture that are living or non-living (picture of a landscape: living-trees, grass, bird, rocks, water, car).* **Level I Students will:** **Identify living vs. non-living things.** *Ex. When given a card of a cat and a card of a car, can identify that the cat is the living thing.*
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.** *Ex. When given a list of the differences, students will be able to identify whether it is a plant or an animal.* *Ex. When given a picture of a plant and animal cell, student can identify which structures are different between the two.* *Ex. When given models of the two cells, students will be able to determine which is the animal and which is the plant.* **Level III Students will:** **Explore, and identify, the structure and function of major parts of a cell.** *Ex. Given labeled pictures of the major parts of a cell, and cards with the different functions, student can match the correct part and function.* **Level II Students will:** **Identify major structures within a plant cell.** *Ex. Have examples of plant cells and have students identity by pointing, nodding, verbalizing to identify the major structures.* *Ex. Add nucleus, cell membrane, cell wall, and chloroplast to word wall.* **Level I Students will:** **Attend to a lesson about cells and their function.** *Ex. Story will be read aloud, showing pictures, teacher will emphasize and define the word cell.*

LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Given pictures of organs, students can model correct placement of the organ into a body system.* **Level II Students will:** **Identify organs within various body systems.** Ex. Given a picture of an organ, can identify it correctly through verbal, matching, etc. (picture of stomach, identifies as stomach). *Ex. Given a picture of an organ system, can identify organs when asked (teacher asks where is the brain, student points to it).* *Ex. When given a body system and pictures of the various organs, student can identify the organs within the system.* **Level I Students will:** **Attend to the lesson about the various organs within a body system.** *Ex. Show a picture of a heart and talk about how it stands for love but also is the body's major organ for moving blood throughout the body.*
MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. Clarification Statement: Examples of 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 vocalization of animals 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 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.	**SES-MS-LS1-4. Identify the characteristics of plants and behaviors of animals that support successful reproduction.**	**Level IV Students will:** **Explain how a behavior, or structure, supports reproductive success.** *Ex. The white part of a dandelion helps the seed move to a new location.* *Ex. The strongest elk reproduces more-can defend the babies better.* **Level III Students will:** **Identify the characteristics of plants, and behaviors of animals, that support successful reproduction.** *Ex. plumage, strength, bright colors attracting bees, butterflies for pollination* *Ex. seed structures, defenses, etc.* **Level II Students will:** **With prompting and support, discuss indicators of successful reproduction.** *Ex. Given a scenario of a pile of seeds vs spread out seeds, student identifies that spread out seed would more successful.* *Ex. Given a scenario of a pack of 4 cubs where 2 make it to adulthood, and a pack of 4 cubs were 4 make it to adulthood, student identifies the 4 cubs are most successful.* **Level I Students will:** **Attend to a lesson about a plant vs. an animal.** *Ex. Show various characteristics of a plant and of an animal.*

LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-5. Construct a scientific explanation based on evidence 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 large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.	**SES-MS-LS1-5. Identify environmental conditions needed for successful growth of organisms.**	**Level IV Students will:** **Describe an ideal environment for various organisms.** *Ex. Given an organism, can describe what would need to be in an environment for it to survive.* **Level III Students will:** **Identify environmental conditions needed for successful growth of organisms.** *Ex. Given pictures of two environments, students can identify which would be better for an animal to survive in (for a fish, lake with plants vs a forest; for a tree, open field vs. a city with little amounts of dirt).* **Level II Students will:** **Identify the basic needs of an animal and a plant.** *Ex. Animal: food, water, shelter; Plant: water, light, space, etc.* **Level I Students will:** **Attend to a lesson about successful growth.** *Ex. Watches a time-lapse video of a tree growing from seed to tree.*
MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.	**SES-MS-LS1-6. Model what a plant uses, what it creates, and what the plant releases during photosynthesis.**	**Level IV Students will:** **Design an experiment to determine what would occur to a plant if one of the needed aspects of photosynthesis was missing.** *Ex. Student can test what happens to the plant if it was in a dark box (missing sunlight).* *Ex. Student can test what happens to the plant if it was in a closed plastic bag (missing Co2).* *Ex. Student can test what would happen if the plant wasn't watered (missing water).* *Ex. Student can pose the situation, then watch a demonstration or video of it occurring.* **Level III Students will:** **Model what a plant uses, what it creates, and what the plant releases during photosynthesis.** *Ex. Given a picture of a plant, and cards with vocab words, can place carbon dioxide, water, and sunlight as what the plant uses, sugar as what is made, and oxygen as what is released.* **Level II Students will:** **Discuss/identify the specific things that are required in order for photosynthesis to occur.** *Ex. When talking about what a plant needs to grow, students identify water, sunlight, and carbon dioxide.* *Ex. Discuss a diagram outlining the steps of photosynthesis.* **Level I Students will:** **Attend to a lesson on photosynthesis.** *Ex. Watch video of the photosynthesis process.*

LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-7. Develop a model to describe how food molecules (sugar) are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.	**SES-MS-LS1-7. Recognize that food is used to produce energy for organisms to live.**	**Level IV Students will:** **Explain that food is broken down into smaller parts during digestion, and those smaller parts provide energy for organisms.** *Ex. Create a simple diagram of the process of eating, chewing, digestion.* *Ex. Verbally describe the process of eating, chewing, digestion.* Teacher note: Digestion is an important term but not necessary to achieve level IV. **Level III Students will:** **Recognize that food is used to produce energy for organisms to live.** *Ex. Student generates a list of ways that organisms use energy; examples include growth, movement, or thinking/learning.* **Level II Students will:** **Identify items that are eaten to give energy to humans.** *Ex. Pick out food items from a set of examples provided.* **Level I Students will:** **Attend to lessons about gaining energy through eating.** *Ex.* Listen to a story about the relationship between food and energy.
MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	**SES-MS-LS1-8. Identify situations which require a reactive behavior for survival.**	**Level IV Students will:** **Identify that the brain, and behaviors associated with memory, allow animals to survive.** Ex. *If an animal eats something that makes it sick, it will avoid that food in the future.* **Level III Students will:** **Identify situations which require a reactive behavior for survival.** *Ex. Shown a picture with zebra and a nearby cheetah, and a picture of zebra by themselves, student would choose the picture with the cheetah as requiring reactive behavior.* **Level II Students will:** **Identify reactive behaviors that allow animals to survive.** *Ex. When shown a picture of a hot object, they would indicate "Don't touch".* **Level I Students will:** **React to a stimulus within their environment.** *Ex. Student identifies fear when discussing/shown a spider.* *Ex. Student identifies hunger when discussing/shown food.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources. Emphasis should include, but is not limited to, Wyoming ecosystems and examples, such as native trout populations, deer and antelope populations, wolf populations, bitterroot, sagebrush, Indian Paintbrush, macroinvertebrates, etc.	**SES-MS-LS2-1. Recognize the effects of resource availability on individuals and on populations.**	**Level IV Students will:** **Analyze data related to the relationship between resource availability and population size.** *Ex. Predator/Prey population graphs like the number of rabbits related to number of coyotes.* **Level III Students will:** **Recognize the effects of resource availability on individuals and on populations.** *Ex. Student recognizes that if there are a lot of owls, but only a small amount of mice, some of the owls will starve/die.* **Level II Students will:** **List living and nonliving resources in an ecosystem.** *Ex. Given a picture, student can identify the living and non-living resources.* **Level I Students will:** **Attends to lessons about resources, and the impact on organism populations.**
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.	**SES-MS-LS2-2. Identify ways that organisms interact with each other within an ecosystem.**	**Level IV Students will:** **Identify relationships within a group of organisms.** *Ex. When prompted, student can give an example of a predatory relationship.* *Ex. When shown a picture of a group of organisms, student can identify the different types of relationships.* **Level III Students will:** **Identify ways that organisms interact with each other within an ecosystem.** *Ex. Wolf hunting deer (predatory relationship).* *Ex. Two types of birds both eat from the same berry bush (competition).* *Ex. Clownfish and sea anemone (mutualism)* Teacher Note: Could build on matches from Level II, but expands to include relationship vocabulary. **Level II Students will:** **Identify organisms that interact with each other.** *Ex. Match pictures of organisms that interact.* **Level I Students will:** **Attend to a lesson about different organisms interacting.** *Ex. Story about bees pollinating flowers*.

LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. sun, plant, human eating plant, human running, etc.* **Level III Students will:** **Explain that energy moves among living and non-living parts of an ecosystem.** *Ex. Plants get energy from the sun. Animals get energy from eating plants or other animals.* **Level II Students will:** **Recognize that people and animals eat.** *Ex. Show picture of a child playing with a ball and picture of a child eating. Student can identify which child is eating.* *Ex. Student helps feed a classroom pet.* **Level I Students will:** **Attend to a lesson about animals eating different things.** *Ex. Some animals eat plants, some animals eat other animals, and some animals eat both plants and animals.*
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. Wyoming examples could include, but are not limited to, mountain pine beetles, excess precipitation, drought and fires, invasive species, Wyoming species, habitat change, etc.	**SES-MS-LS2-4. Recognize how changes to an ecosystem affect populations.**	**Level IV Students will:** **Explain how a specific change in an environment affects more than one population.** *Ex. Forest fire may harm rabbit populations, but may help some plants and trees grow better.* **Level III Students will:** **Recognize how changes to an ecosystem affect populations.** *Ex. Drought decreases food source for consumers.* **Level II Students will:** **Select events in nature that can affect populations.** *Ex. Picture cards that show a flood, fire, drought, insect infestation.* **Level I Students will:** **Attend to information presented on humans helping the environment.** *Ex. Video clip of humans picking up trash, planting trees, building a birdhouse.*

LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Students could show the many different effects of planting trees in a forest.* **Level III Students will:** **Identify an action that maintains or improves ecosystems and biodiversity.** *Ex. Putting straw, rocks, or plants on the side of the road prevents erosion.* **Level II Students will:** **Distinguish between images that show high biodiversity and low biodiversity.** *Ex. Image of rainforest with various plants and animals vs. picture of desert setting.* **Level I Students will:** **Attend to a lesson about biodiversity.**

LS3 – Heredity Inheritance and Variations of Traits

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.	**SES-MS-LS3-1. Explain that organisms have differences in their traits that can affect their survival.**	**Level IV Students will:** **Identify changes in an organism that would lead to changes in the chance of survival for the organism.** *Ex. Student selects an animal they are familiar with and predicts how they would survive if they had very different traits. What would happen if a grizzly bear had scales like a fish rather than fur?* **Level III Students will:** **Explain that organisms have differences in their traits that can affect their survival.** *Ex. A thicker fur coat will help an organism survive in a cold environment.* *Ex. An albino mouse is more likely to be captured by a hawk.* **Level II Students will:** **Select a beneficial environment for an organism based on its physical traits.** *Ex. An animal with a thick fur coat would live in a cold environment.* *Ex. An animal with fins lives in the water.* **Level I Students will:** **Attend to a lesson about physical traits of organisms.** *Ex. Students participate in a lab with sensory objects such as soft fur, scaly skins, feathers, rough hair.*
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.** *Ex. Using a four-square, have student complete the square and discuss the dominant and recessive traits.* **Level III Students will:** **Students will investigate, and identify, features of living organisms that come from their parents.** *Ex. Have parents complete a chart of personal traits. Students will then compare their own traits with those of their parents to find similarities and differences.* *Ex. Students will match traits of animals with their offspring.* **Level II Students will:** **Identify similarities and differences between plant and animal parents and their offspring.** *Ex. eye color, hair/fur color, height, leaf shape, or other markings, etc.* **Level I Students will:** **Attend to, and recognize, that organisms differ within the same species.** *Ex. Show pictures of dogs, chickens, horses, oaks, and flowers that differ in color and size.*

LS4 Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.	**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.** *Ex. Students can press leaves into soft playdough to leave an impression. The leaf will die but the impression will remain.* **Level II Students will:** **Examine various fossils.** *Ex. Hide fossils in a sand box and have students dig for them.* **Level I Students will:** **Attend to information presented about fossils.** *Ex. The book "Curious about Fossils" by Kate Waters explains why/where fossils form and looks at the lives and important discoveries of some of the great early fossil hunters and collectors.*
MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.	**SES-MS-LS4-2. Identify anatomical similarities between modern organisms and fossil organisms.**	**Level IV Students will:** **Analyze a fossil, or fossil image, and explain which modern animal they believe would be closely related.** *Ex. Wyoming has an abundance of well-preserved fish fossils and students could interact with actual samples and point out structures that are also found in modern fish.* **Level III Students will:** **Identify anatomical similarities between modern organisms and fossil organisms.** *Ex. Compare a fossilized wing to a wing from a modern animal.* *Ex. Compare a fossilized fish to modern fish.* **Level II Students will:** **View images of anatomical structures in modern organisms that are commonly found in fossil remains.** *Ex. Fern leaf, x-rays of vertebrate skeletons, feathers, shells, etc.* **Level I Students will:** **Attend to a lesson about modern organisms and fossilized items.**
MS-LS4-3. This benchmark was removed by the 2016 Science Standards Review Committee	**None**	

LS4 Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population affect individuals' probability of surviving and reproducing in a specific environment. Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations. It is important to look at both positive and negative effects that variations of traits may have on individuals.	**SES-MS-LS4-4. Incorporated in SES-MS-LS3-1.**	**Not Applicable.**
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.** *Ex. When students are presented information about how an animal or plant species has changed over time, students can communicate the traits that were desired.* **Level III Students will:** **Identify desirable traits that can be passed on to offspring.** *Ex. Students can view a picture of an organism and identify traits that would be desirable. For example, when looking at a picture of a chicken they would select a picture of a basket of eggs rather than a glass/carton of milk.* *Ex. When looking at a picture of a corn plant they select the image with the larger ears of corn.* **Level II Students will:** **Recognize the concept that parents pass traits to their offspring.** *Ex. Match a golden retriever puppy to a golden retriever parent.* *Ex. Match a small pine tree to a large pine tree, rather than a large aspen tree.* **Level I Students will:** **Attend to a lesson about organisms with traits that humans have influenced.** *Ex. black lab, a poodle, cattle, horses, wheat, etc.*

LS4 Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 populations over time.	**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.** *Ex. Human height over time.* *Ex. Changes in natural peaches from 4000 BC compared to the genetically modified modern peach.* **Level III Students will:** **Demonstrate understanding that natural selection changes distribution of traits in a population over time.** *Ex. Introduction of a predator will increase the number of fast individuals in prey population over time as the number of slower individuals is decreased.* **Level II Students will:** **Identify traits that are beneficial for different organisms.** *Ex. Computer simulation of rabbit survival based on coat color and predation.* **Level I Students will:** **Attend to images of populations that include individuals with different traits.** *Ex. Picture of the many breeds of dogs.*

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. When provided with a diagram with the Earth, sun, and blank moon positions, can correctly identify and shade the lunar phases. (shade=dark/unseen part of the moon)* *Ex. Student can place and label the order of the sun, moon, and Earth in the correct order to represent an eclipse of the sun and moon, and shades the general area where the umbra/penumbra are cast. (Ex-solar eclipse, shades the side of the Earth closest to the moon; lunar eclipse, shades the space behind the Earth or the side of the moon closest to the Earth)* **Level III Students will:** **Model the Earth-sun-moon positions for lunar phases, eclipses of the sun and moon, and seasons.** *Ex. Place pictures of the moon phases (with light and dark side shown) in the correct locations in relation to the sun and Earth.* *Ex. Place pictures of the sun, moon, and Earth in the correct order to represent an eclipse of the sun and an eclipse of the moon.* **Level II Students will:** **Label the Earth-sun-moon positions for lunar phases and eclipses of the sun and moon, and seasons.** *Ex. When provided with a diagram of lunar phases (with light and dark side shown), can identify/label the moon phases in their positions around the Earth in relation to the sun.* *Ex. When provided with a diagram of a solar eclipse and a lunar eclipse, can identify/label the sun, moon, and Earth.* **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.** *Ex. Holds the representation of the Earth while the teacher or another student moves the moon around it in relation to the sun to demonstrate phase positions.* *Ex. Holds a flashlight while the teacher or another student places the moon or Earth to demonstrate solar and lunar eclipse positions.*

ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Student can identify that the sun is the source of gravity for the planets' orbital patterns.* *Ex. The Earth is the source of gravity for the moon's orbital pattern.* **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.** *Ex. Model the orbit patterns of objects within the solar system.* **Level II Students will:** **Model the movement of space objects, around a center object, to represent the force of gravity.** *Ex. Student swings a styrofoam ball above their head.* *Ex. Student moves a ball on a string that is pinned to a foam board.* **Level I Students will:** **Attend to a lesson about space object movement.** *Ex. Watch a simulation of orbit patterns.*
MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.	**SES-MS-ESS1-3. Identify categories of solar system objects (e.g., planets, meteors, asteroids, comets, and moon).**	**Level IV Students will:** **Compare categories of solar system objects by distance and orbit period (e.g., planets, meteors, asteroids, comets).** *Ex. Student identifies that Mars is closer to the sun and has shorter orbital period than Jupiter.* **Level III Students will:** **Identify categories of solar system objects (e.g., planets, meteors, asteroids, comets, moons).** *Ex. Given a picture, student can differentiate between the various objects.* **Level II Students will:** **Identify the planets in our solar system.** **Level I Students will:** **Attend to a lesson about our solar system.** *Ex. Watches a video about the solar system.*

ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS1-4. Construct a scientific explanation based on evidence from rocks and rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.	**SES-MS-ESS1-4. Organize, or model, evidence from rocks and rock strata within the geologic time scale to demonstrate Earth's history.**	**Level IV Students will:** **Organize past formation of Earth's continents using evidence on a map.** *Ex. Reconstruct Pangaea by placing the continents correctly through matching similar fossils, mountain chains, and organisms.* **Level III Students will:** **Organize, or model, evidence from rocks and rock strata within the geologic time scale to demonstrate Earth's history.** *Ex. Provided with 3 geologic columns, can match the different levels and place them in order next to each other.* **Level II Students will:** **Identify the order, from youngest to oldest, layer in a rock strata occurred.** *Ex. Given a bottle with colored sand in layers, can identify which layer would have to be put in the bottle first, next, to last. (Bottom layer goes in first, then works way up to top.)* **Level I Students will:** **Identify various strata that is the same or different.** *Ex. Provided with pictures showing various "rock strata", can identify which ones are the same and which ones are different.*

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Given labeled picture cards, student will place them in the correct cycle order.* **Level III Students will:** **Model the cycling processes involved in the creation of various rock forms.** *Ex. Given a rock cycle with types of rocks already placed (igneous, sedimentary, metamorphic, magma) the student will place labeled pictures of the processes in the correct locations.* **Level II Students will:** **Compare the different rock forms.** Ex. Given a piece of granite and a piece of basalt, identify that the granite is rough and the basalt is smooth. **Level I Students will:** **Attend/Interact with rocks.** *Ex. Student feels a rock.* *Ex. Student looks at different rocks.*
MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.	**SES-MS-ESS2-2. Identify geoscience processes that can change Earth's surface over short time scales or long time scales.**	**Level IV Students will:** **Identify how a geoscience process changes the Earth's surface over short time scales and longtime scales.** *Ex. Student identifies that a river creates a canyon.* *Ex. Student identifies that plate movement creates mountains.* *Ex. Student identifies that lava, ash, and debris from a volcanic eruption changes the surface around it.* **Level III Students will:** **Identify geoscience processes that can change Earth's surface over short time scales or long time scales.** *Ex. Student identifies that a volcanic eruption changes the surface in a short time scale.* *Ex. Student identifies that formation of a mountain range changes the surface over a long time scale.* **Level II Students will:** **Identify scenarios where a surface change has occurred.** *Ex. Given before and after pictures of various scenarios, student can identify which ones involve a surface change. (Given a before and after picture of an earthquake, student identifies a change. Given a before and after picture of a rainstorm, student identifies that the surface has not changed.)* **Level I Students will:** **Attend to a lesson about geoscience processes causing surface changes.** *Ex. Watches a time-lapse video of plate motions.* *Ex. Watches a video of a meteor impact.*

ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Reconstruct Pangaea by placing the continents correctly through matching similar fossils, mountain chains, and continental shapes, and indicate that similar fossils and mountain ranges could mean they were once near each other.* **Level III Students will:** **Compare locations of fossils, rocks, continental shapes, and structures as evidence of past plate motions.** *Ex. Given a world map with fossils, mountain ranges, and continents outlined, students can identify where similarities occur.* **Level II Students will:** **Recognize that plates move and change Earth's surface.** *Ex. Student recognizes that plates can move toward, away from, or slide past each other.* *Ex. Using pieces of paper, can recognize that there is change when the papers (plates) are moved toward, away from, or slide past each other.* **Level I Students will:** **Attend to a lesson about past plate motions, and evidence that supports the movement.** *Ex. Watches a video about Pangaea.*
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 pathways of the hydrologic cycle. Examples of models can be conceptual or physical.	**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.** *Ex. Given labeled picture cards, student can place in the correct cycle order.* **Level III Students will:** **Identify the processes involved in the cycling Earth's water.** *Ex. Given a process picture card, can label or match the process name. (e.g., picture of rain, snow, sleet, hail=precipitation; picture of cloud=condensation; etc.)* **Level II Students will:** **Identify the direction in which water moves through the water cycle.** *Ex. Given a labeled water cycle picture, can indicate the direction the cycle goes in. (draws arrow from evaporation to condensation)* **Level I Students will:** **Attend to a lesson about the water cycle.** *Ex. Watch a demonstration or video showing the water cycle.*

ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).	**SES-MS-ESS2-5. Utilize data to compare weather conditions in different locations on the same day.** Teacher notes: Examples of data can be provided to students (such as weather maps, diagrams, and visualizations).	**Level IV Students will:** **Collect data to compare how weather conditions changed in different locations on multiple days.** *Ex. Student uses a week's worth of weather reports for 2 cities and compares how each one changed over the period of a week. (can include: city 1 got hotter, started sunny, then rainy; city 2 got colder, started rainy then became snowy)* **Level III Students will:** **Utilize data to compare weather conditions in different locations on the same day.** *Ex. Given weather reports for their city and San Francisco, CA, student can identify how they are different. (can include: which one is hotter, precipitation, cloud coverage, wind, etc.)* **Level II Students will:** **Identify different weather conditions.** *Ex. Given a picture of a sunny place, can identify it as hot, sunny, etc.* *Ex. Given a picture of a rainy place, can identify it as cloudy, rain, cold, etc.* *Ex. Identify current weather outside.* **Level I Students will:** **Attend to a lesson about weather.** *Ex. Watches a video about various weather conditions.*
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 sunlight-driven 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.** *Ex. Student communicates that a mountain at a higher latitude is colder than a mountain at a lower latitude due to angle of sunlight.* **Level III Students will:** **Identify how latitude and altitude influence climate.** *Ex. Student uses a map to identify that closer to the equator (lower latitude) is warmer than further away from the equator (higher latitude).* *Ex. Student uses a map with altitude and temperature to identify that the higher the altitude the colder it is.* **Level II Students will:** **Compare various climates.** *Ex. Experiences virtual field trips (with observable aspects such as temp, humidity, etc.) and identify how they are different.* *Ex. Discuss climate for their area.* **Level I Students will:** **Attend to a lesson about climate.** *Ex. Virtual field trips to various climates.*

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).	**SES-MS-ESS3-1. Identify how the levels of Earth's resources can change over time.**	**Level IV Students will:** **Propose a solution in response to the possibility of the depletion of Earth's resources.** *Ex. Voice ideas during a discussion on the depletion of groundwater, minerals, or energy.* *Ex. Devise an idea regarding alternative energy sources.* *Ex. Voice ideas for solving a decreasing food availability* **Level III Students will:** **Identify how the levels of Earth's resources can change over time.** *Ex. Increase in population sizes results in more organisms using vehicles, which decreases the levels of petroleum available.* *Ex. Flood can cause an increase in groundwater.* *Ex. Increase in population would decrease food availability.* **Level II Students will:** **Recognizes that there are multiple uses for Earth's resources.** *Ex. groundwater- drinking, watering, doing laundry, etc.* *Ex. minerals- tools, jewelry, soap, cleaners, etc.* *Ex. energy- gasoline, electricity, etc.* *Ex. food- corn for fuel, food, etc.* **Level I Students will:** **Attend to a lesson about Earth's different resources.** *Ex. Watch a video about coal.*

ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).	**SES-MS-ESS3-2. Recognize that some natural hazards (e.g., volcanic eruptions, severe weather) can be predicted while others are not currently predictable.**	**Level IV Students will:** **Identify how technology is increasing the predictability of natural hazards (e.g., volcanic eruptions, severe weather).** *Ex. Student identifies what technology is used and how it has changed in predicting natural hazards.* **Level III Students will:** **Recognize that some natural hazards (e.g., volcanic eruptions, severe weather) can be predicted while others are not currently predictable.** *Ex. Classify predictable natural hazards compared to unpredictable natural hazards.* **Level II Students will:** **Identify natural hazards and the characteristics of them.** *Ex. Given pictures, can identify each natural hazard. (Ex: picture of a tornado, student identifies as tornado)* **Level I Students will:** **Attend to lessons about natural hazards.** *Ex. Watch a video about tornadoes.*
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 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.	**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.** *Ex. They can set up recycling bins at school and/or at home.* **Level III Students will:** **Model ways that humans can minimize their impact on the environment.** *Ex. recycling, turning off water when brushing teeth, carpooling, etc.* **Level II Students will:** **Recognize the ways that humans impact their environment.** *Ex. pollution, deforestation, irrigation, water conservation, etc.* **Level I Students will:** **Attend to a lesson about humans interacting with their environment.**

ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS3-4. Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems. Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of changing human populations and the consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.	**SES-MS-ESS3-4. Is incorporated into SES-MS-ESS3-1.**	**Not Applicable.**
MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused changes in global temperatures over time. Clarification Statement: Examples of factors include natural processes and human activities. Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases, and the frequency and rates of natural processes and human activities.	**SES-MS-ESS3-5. Recognize natural processes, and human activities, that may impact global temperatures.**	**Level IV Students will:** **Identify effects of an increase in global temperatures.** *Ex. temperatures rise, glaciers melt, polar bear's natural habitat decreases* **Level III Students will:** **Recognize natural processes, and human activities, that may impact global temperatures.** *Ex. ocean currents, prevailing winds, gas levels in the atmosphere, human use of fossil fuels, etc.* **Level II Students will:** **Identify the impact of increasing temperatures.** *Ex. Student applies warm water to an ice cube and observes/identifies the ice melts.* *Ex. Students observe a plant under a heat lamp and a plant in the sun. Observes/identifies the plant under the heat lamp needs more water or dies.* *Ex. Temperature changes inside of a car relative to outside conditions.* **Level I Students will:** **Attend to a lesson about increasing global temperatures.**

ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Brainstorm with student's challenges they face in their school or home.* **Level II Students will:** **Recognize a problem that can be solved when presented with a specific scenario.** *Ex. Given pictures of a ball, broken shovel, and a bucket, student selects the broken shovel as being the problem that can be solved.* **Level I Students will:** **Attend to a visualization of a problem and its solution.** *Ex. Teacher skit that includes a teacher's reaction to a problem and the teacher finding a solution to the problem.*
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. Clarification Statement: Preliminary building designs could involve overall dimensions, number of rooms, entries & exits, orientation to permit solar energy collection. Criteria and constraints could include these design elements or those of another project.	**SES-MS-ETS1-2. Evaluate solutions to given problems.**	**Level IV Students will:** **Explain why one design solution is better than another.** **Level III Students will:** **Evaluate solutions to given problems.** *Ex. Students are presented with a scenario such as a student in a wheelchair that is struggling with a set of steps into a building. Students then select the best solution from a set of images.* **Level II Students will:** **Recognize a problem that can be solved when presented with a specific scenario.** *Ex. Given a picture of a car with a flat tire, the student can identify the flat tire as a problem.* **Level I Students will:** **Attends to a visualization of a problem and its solution.** *Ex. Teacher skit that includes a teacher's reaction to a problem and the teacher finding a solution to the problem.*

ETS1 – Engineering, Technology, & Applications of Science (cont.)

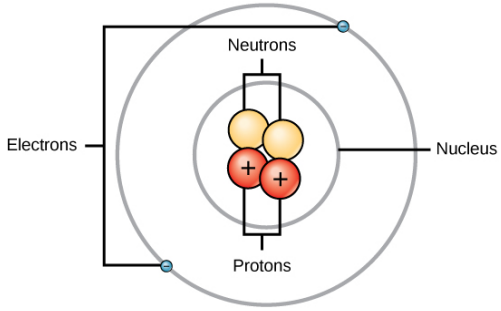
2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. Clarification Statement: Tests could include building capacity, heating efficiency, use of hazardous materials, meeting ADA requirements, or earthquake survival.	**SES-MS-ETS1-3. Analyze results from the testing of possible solutions.**	**Level IV Students will:** **Identify what characteristics caused the best solution to be better than the rest.** **Level III Students will:** **Analyze results from the testing of possible solutions.** **Level II Students will:** **Identify which solution was better than the other(s).** **Level I Students will:** **Attend to a story about how making choices can affect an outcome.** Teacher note: Examples purposely not provided so that students have the opportunity to identify problems that matter to them personally.
MS-ETS1-4. Develop a model for a proposed object, tool, or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design. Clarification Statement: The object, tool or process could include a bicycle, a bridge, a smart furnace, or an auto airbag system. Test data could be collected from tests of a model object, or from test data for a similar object, tools, or process found on the internet.	**SES-MS-ETS1-4. Create an object or tool from materials provided.**	**Level IV Students will:** **Identify an improvement possibility for an existing object or tool.** **Level III Students will:** **Create an object or tool from materials provided.** **Level II Students will:** **Identify the purpose of objects or tools.** **Level I Students will:** **Attend to a lesson about using objects or tools.**

ETS2 - Engineering, Technology, Science, and Society

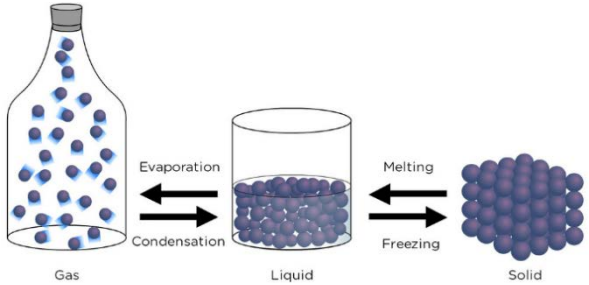
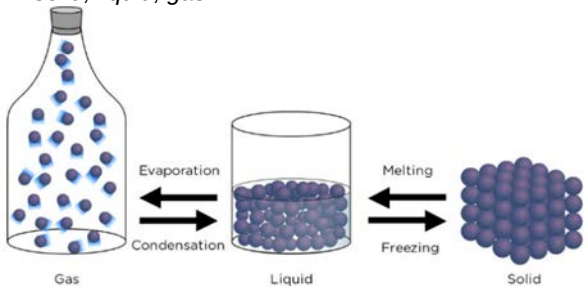
2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ETS2-1. Ask questions about a common household appliance, collect data to reverse-engineer the appliance and learn how it's design has evolved, describe how scientific discoveries, technological advances, and engineering design played significant roles in its development, and explore how science, engineering and technology might be used together or individually in producing improved versions of the appliance. Clarification Statement: Examples of household appliances could include radios, heaters, food processors, refrigerators, and washing machines.	**SES-MS-ETS2-1. Ask questions about common household, or classroom, appliances.**	**Level IV Students will:** **Identify ways common household, or classroom appliances, have improved human lives.** **Level III Students will:** **Ask questions about common household, or classroom, appliances.** *Ex. How does the pencil sharpener work?* *Ex. Who created the refrigerator?* **Level II Students will:** **Identify common household, or classroom, appliances.** *Ex. dishwasher, radio, pencil sharpener, lamp* **Level I Students will:** **Attend to lessons about use of appliances.**
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 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.	**SES-MS-ETS2-2. Identify consequences of human choices.**	**Level IV Students will:** **Identify how their personal choices affect others and their environment.** *Ex. Student identifies that throwing their trash on the floor can cause more work for others, create hazards, or ruin the flooring.* **Level III Students will:** **Identify consequences of human choices.** *Ex. Eating too much candy can make you sick.* **Level II Students will:** **Identify choices made throughout their day.** **Level I Students will:** **Attend to a lesson about choices and consequences.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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).** *Ex.*  *(Photo from: CNX OpenStax)* **Level II Students will:** **Identify a diagram or model of an atom.** *Ex. When given two choices, choose the picture or diagram that represents 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 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.	**SES-HS-PS1-2. Use a periodic table to identify symbols and atomic numbers for five main group elements (1-20.)**	**Level IV Students will:** **Use a Periodic Table to identify symbols, and atomic numbers, for main group elements (1-20).** **Level III Students will:** **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.**

PS1 - Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the macroscopic scale to infer the strength of electrical forces between particles. Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of macroscopic properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.	**SES-HS-PS1-3. Using models, investigate the results of changes in states of matter.**	**Level IV Students will:** **Gather evidence about how the strength of electrical forces between particles change the state of matter.** *Ex. Ice at 0-degrees vs water at 0-degrees.* **Level III Students will:** **Using models, investigate the results of changes in states of matter.** *Ex.*  *(Photo from: Slyavula Education)* **Level II Students will:** **Identify different states of matter.** *Ex: solid, liquid, gas*  *(Photo from: Slyavula Education)* **Level I Students will:** **Attend to an investigation of states of matter.**

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. Clarification Statement: Emphasis is on the idea that a chemical reaction, as a system, affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.	**SES-HS-PS1-4. Using a model, determine if the product absorbs or releases energy, when given the reactants in a chemical reaction.**	**Level IV Students will:** **Investigate a model which illustrates that the amount of energy on one side of a chemical reaction will equal the amount of energy on the opposite side of the chemical reaction.** **Level III Students will:** **Using a model, determine if the product absorbs or releases energy, when given the reactants in a chemical reaction.** *Ex. Baking soda and vinegar absorbs energy.* *Ex. Magnesium in Hydrogen Chloride releases energy.* **Level II Students will:** **Given two models, identify the one that illustrates that each side of the reaction matches (conservation of matter and energy).** *Ex: Match two items that are identical.* **Level I Students will:** **Attend to lesson about conservation of matter and energy.**
HS-PS1-5. Apply scientific principles and use evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.	**SES-HS-PS1-5. Conduct an investigation measuring temperature differences, while observing and recording the reactions.**	**Level IV Students will:** **Compare data collected, through investigative processes, of temperature differences of substances used in reactions.** **Level III Students will:** **Conduct an investigation measuring temperature differences, while observing and recording the reactions.** *Ex. Using warm vinegar vs. cold vinegar in a baking soda experiment.* **Level II Students will:** **Investigate reacting substances of different temperatures.** **Level I Students will:** **Attend to an investigation of the reaction of substances of different temperatures.**

PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Mentos experiment – change the number of Mentos or the type of soda.* *Ex. Baking soda and vinegar experiment, changing the amount of baking soda used.* **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 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.	**SES-HS-PS1-7. Integrated in PS1-4.**	**Not applicable.**

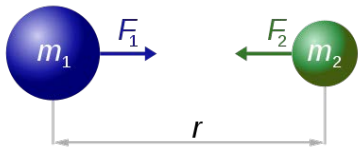
PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Look up models of fission, fusion, and radioactive decay for comparison.* **Level I Students will:** **Attend to a presentation on models of fission, fusion, and radioactive decay.** *Ex. Take apart and put together Legos.*

PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. Clarification Statement: Examples of data could come from lab experiments or include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.	**SES-HS-PS2-1. Predict the outcome, when changing either mass or force, in an experiment using Newton's Second Law of Motion.**	**Level IV Students will:** **Using Newton's Second Law of Motion, compare the data from a series of experiments where force or mass is changed.** **Level III Students will:** **Predict the outcome, when changing either mass or force, in an experiment using Newton's Second Law of Motion.** **Level II Students will:** **Identify whether mass or force is changed in an experiment.** **Level I Students will:** **Attend to a lesson on how changing mass and force in an experiment change the outcome.**
HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.	**SES-HS-PS2-2. Demonstrate what happens to the velocity of an object when the mass of the object is increased.** Teacher Note: Calculator use is permitted.	**Level IV Students will:** **Use a model to demonstrate that momentum is conserved in a collision.** *Ex. Link to Collision Lab simulation* *Ex: analysis of car crash videos* **Level III Students will:** **Demonstrate what happens to the velocity of an object when the mass of the object is increased.** *Ex. An object in motion would slow down if the mass increased.* *Ex: When a basketball & bowling ball are pushed with the same force, the bowling ball rolls further due to its higher mass.* **Level II Students will:** **Demonstrate the velocity of an object.** *Ex. Using an object or illustration, student should identify or demonstrate velocity (student drops/pushes an object to show movement).* **Level I Students will:** **Attend to a demonstration of velocity.**

PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 include a football helmet or a parachute.	**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.** *Ex. Egg Drop Activity* **Level III Students will:** **Select between a variety of designs to minimize force on an object, during a collision, and record outcomes.** *Ex. Egg Drop Activity - Duct tape and cardboard vs. bubble wrap vs. egg carton, etc.* **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 an object during a collision.**
HS-PS2-4. Use mathematical representations to predict the gravitational and/or electrostatic forces between objects using Newton's Law of Gravitation and/or Coulomb's Law, respectively. Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and/or electric fields.	**SES-HS-PS2-4. Demonstrate that gravitational forces are constant.**	**Level IV Students will:** **Use mathematical representation to indicate that gravitational forces are always attractive.** *Ex.*  *(Photo from Dennis Nilsson)* $F_1 = F_2 = G\frac{m_1 \times m_2}{r^2}$ **Level III Students will:** **Demonstrate that gravitational forces are constant.** *Ex. Repeatedly show that different objects dropped will always fall towards the ground.* **Level II Students will:** **Recognize that objects can be attracted to one another.** *Ex. Balloon sticks to a wall due to static, but will eventually fall to the ground.* **Level I Students will:** **Attend to a demonstration of gravitational forces.**

PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Link to activities on magnets and electromagnets* **Level III Students will:** **Conduct an experiment to test for a magnetic field around an electromagnet.** *Ex. Use battery with copper coils to pick up paperclips.* *Ex. Link to activities on magnets and electromagnets* **Level II Students will:** **Identify a magnetic field.** *Ex. Given a diagram or demonstration, student identifies magnetic field lines.* *Ex. Link to activities on magnets and electromagnets* **Level I Students will:** **Attend to a demonstration of a magnetic field around an electromagnet.** *Ex. Link to activities on magnets and electromagnets*
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.** *Ex. toothpick bridge, straw bridge, etc.* **Level III Students will:** **Demonstrate why material selection is important in building stable structure.** *Ex. Have students manipulate different objects to demonstrate which are best for building.* **Level II Students will:** **Given multiple pictures of familiar structures, select the one that illustrates the strongest structural elements.** *Ex. the house in the "Three Little Pigs" story* **Level I Students will:** **Attend to a demonstration of why material selection is important in building a stable structure.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 - Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS3-1. Create or apply a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.	**SES-HS-PS3-1. Demonstrate the differences in the energy of a system when a component is changed.**	**Level IV Students will:** **Demonstrate, and describe, the effect of a change in energy on a system.** **Level III Students will:** **Demonstrate differences in the energy of a system when a component is changed.** *Ex. An increase or decrease in thermal energy, wind energy, water flow, etc. will change the energy of a system.* **Level II Students will:** **Compare the energies of two objects.** *Ex. Shown two different balls (differing weight, size, etc.) rolling down a hill, identify which one has more kinetic energy.* *Ex. Provided with 1 cup of cold water and 1 cup of warm water, the student identifies which cup contains more energy.* **Level I Students will:** **Participate in changing the energy of an object.** *Ex. Push a ball down a slope.* *Ex: Kick a ball to change the energy of the object.*
HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the Earth, and the energy stored between two electrically charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.	**SES-HS-PS3-2. Demonstrate that energy manifests itself in multiple ways, such as motion, sound, light, and thermal energy.**	**Level IV Students will:** **Develop, and describe, models of energy.** *Ex. Link to activities on Energy Forms and Changes* *Ex. Link to virtual lab* **Level III Students will:** **Demonstrate that energy manifests itself in multiple ways, such as motion, sound, light, and thermal energy.** *Ex. Link to activities on Energy Forms and Changes* *Ex. Link to virtual lab* **Level II Students will:** **Given illustrations of different types of energy, match each to its respective type of energy.** *Ex. A picture of the sun matched with solar energy/solar panel; a power plant matched with electrical energy.* **Level I Students will:** **Attend to a demonstration of the multiple ways in which energy can be manifested.**

PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 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.	**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.** *Ex. Link to virtual lab* **Level III Students will:** **Conduct an experiment to convert one form of energy to another form of energy.** *Ex. Make nachos with solar oven.* *Ex. Test different levels of wind energy on windmills or turbines.* **Level II Students will:** **Given an example or illustration, identify one type of energy in an energy conversion.** *Ex: An automobile engine changes chemical energy to mechanical and heat energy.* *Ex: A tree changes solar energy to chemical energy.* *Ex. Hammering a nail changes mechanical energy to deformation and heat energy.* *Ex. An electric mixer changes electrical energy to mechanical and heat energy.* *Ex. A lamp changes electrical energy to radiant and heat energy.* *Ex: Wind energy to mechanical energy in windmills or turbines.* **Level I Students will:** **Attend to a demonstration of energy conversion.**

PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system. Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.	**SES-HS-PS3-4. Conduct an experiment demonstrating the transfer of thermal energy when two components, of different temperature, are combined within a closed system.**	**Level IV Students will:** **Conduct an investigation, recording data, and describe the transfer of thermal energy.** *Ex. Link to virtual lab investigating How does Thermal Energy Affect the State of a Substance?* **Level III Students will:** **Conduct an experiment demonstrating the transfer of thermal energy when two components, of different temperature, are combined within a closed system.** *Ex. Mix two liquids of different initial temperatures together.* **Level II Students will:** **Describe how thermal energy can be absorbed.** *Ex. Describe how different colors of objects absorb thermal energy differently.* *Ex: Black paper in the sun gets warm faster than white paper.* *Ex: A thermometer on a car hood in the sun warms up.* **Level I Students will:** **Observe how thermal energy can be absorbed.** *Ex: Black paper in the sun gets warm.*
HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.	**SES-HS-PS3-5. Demonstrate that when two interacting objects change position, the interacting forces change.**	**Level IV Students will:** **Develop, and use, a model to demonstrate how to maximize the interacting forces when changing the position of two objects.** *Ex. Student manipulate magnets at different distances from objects produce different forces, such as a magnet closer to a pile of paper clips picks up more than a magnet further away.* **Level III Students will:** **Demonstrate that when two interacting objects change position, the interacting forces change.** *Ex. If the sun and moon were to become farther apart, the force between them would decrease.* **Level II Students will:** **Given two examples, distinguish between the effects of distance upon forces.** *Ex. Magnets at different distances from objects produce different forces, such as a magnet closer to a pile of paper clips picks up more than a magnet further away.* **Level I Students will:** **Attend to a demonstration of two interacting objects changing position.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4: Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Change the movement of the rope in order to change the patterns.* **Level III Students will:** **Demonstrate that simple waves have a repeating pattern with a specific wavelength, frequency, and amplitude.** *Ex. Move a rope (or a slinky) to create patterns which can be measured. Draw diagrams of the movement.* **Level II Students will:** **Identify two or more types of waves.** *Ex. Given a picture of a light wave, can match/identify as a light wave.* **Level I Students will:** **Attend to a demonstration of how a wave moves.** *Ex. Watch the teacher create a wave using a rope.*
HS-PS4-2. Evaluate the advantages and disadvantages of using digital transmission and storage of information. Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.	**SES-HS-PS4-2. Explore both physical and digital storage.**	**Level IV Students will:** **Evaluate different ways to store digital information by discussing advantages/disadvantages.** *Ex. List pros and cons of various digital storage methods. (on a computer hard drive, a USB drive, cloud storage, etc.)* **Level III Students will:** **Explore both physical and digital storage.** *Ex. saving files on a computer or USB* *Ex. printing a document and placing it in a folder* *Ex. pictures-saving on a phone, a computer, etc. vs. a photo album* **Level II Students will:** **Distinguish between digital and physical storage examples.** *Ex. identifies a computer as digital storage* *Ex. identifies a box with papers as physical storage* **Level I Students will:** **Attend to a lesson, or discussion, about different storage types.**

PS4: Waves and their Applications in Technologies for information Transfer (cont.)

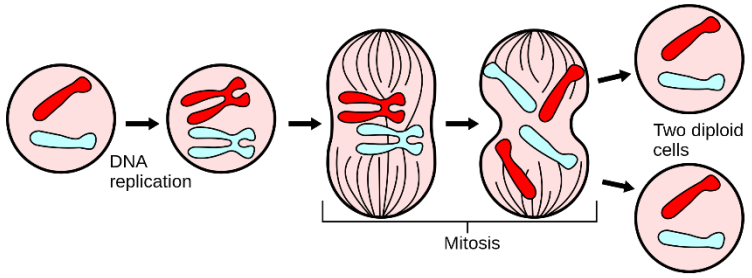
2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS4-3. Evaluate the evidence behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.	**SES-HS-PS4-3.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**
HS-PS4-4 was removed. The evaluated validity and reliability of claims in a variety of materials. *See HS-ETS1-5 pg. 64. (on the 2016 Science Standards)	**none**	**Not applicable.**
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 technology.	**SES-HS-PS4-5.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

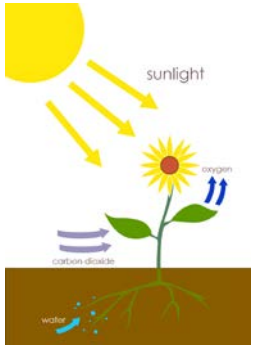
LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Limited to sugars, phosphates and nitrogen bases.* **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-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms. Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.	**SES-HS-LS1-2. Construct a model of hierarchical organization of interacting systems from smallest to largest.**	**Level IV Students will:** **Construct, and explain, a model of hierarchical organization of interacting systems from smallest to largest.** **Level III Students will:** **Construct a model of hierarchical organization of interacting systems from smallest to largest.** *Ex. From atoms, to molecules, to cells, to tissues, to systems to organism.* **Level II Students will:** **Using diagrams or manipulatives, correctly arrange the interacting system of a hierarchical organization within a multi-cellular organism.** **Level I Students will:** **Attend to a demonstration of the hierarchical organization within a multi-cellular organism.**
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Clarification Statement: Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.	**SES-HS-LS1-3. Identify a feedback mechanism that helps maintain homeostasis.**	**Level IV Students will:** **Demonstrate, and explain, a feedback mechanism that helps maintain homeostasis.** *Ex. Link to virtual lab* **Level III Students will:** **Identify a feedback mechanism that helps maintain homeostasis.** *Ex. Sweating means my body is too hot and is trying to maintain homeostasis.* **Level II Students will:** **Select a model of a feedback mechanism that helps maintain homeostasis.** *Ex. Given a picture of a coat and a picture of a bucket of ice, student chooses which would help maintain homeostasis in a cold environment.* **Level I Students will:** *Attend to a demonstration of a feedback mechanism that helps to maintain homeostasis.*

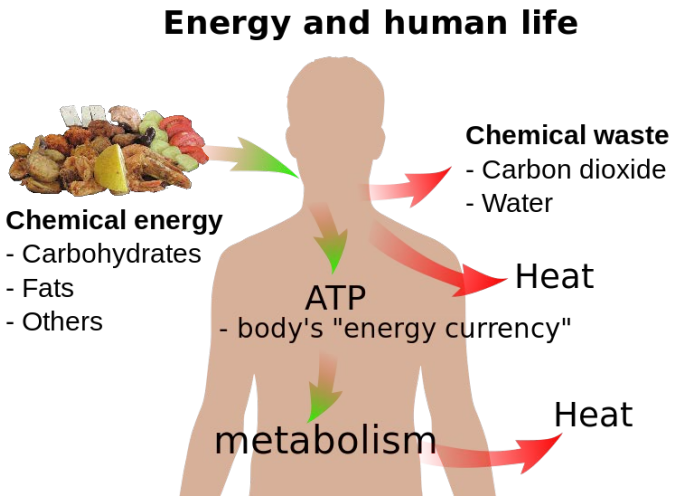
LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. Clarification Statement: Cellular division should include a description of the entire cell cycle along with the phases of mitosis.	**SES-HS-LS1-4. Use a model to demonstrate mitosis.**	**Level IV Students will:** **Label, and discuss, a model of the cell cycle.** *Ex. Students are given a diagram and label the phases in the cell cycle.* **Level III Students will:** **Use a model to demonstrate mitosis.** *Ex.*  *(Photo from: Mysid)* **Level II Students will:** **Recognize that mitosis is the exact duplication of a cell.** **Level I Students will:** **Recognize a pair of duplicate objects.**

LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.	**SES-HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.**	**Level IV Students will:** **Create, and label, a model of how photosynthesis transforms light energy into stored chemical energy (glucose).** **Level III Students will:** **Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.** *Ex.*  *(Photo by: At09kg)* **Level II Students will:** **Recognize that plants need sunlight to make food.** **Level I Students will:** **Attend to a simulation of the process of photosynthesis.**
HS-LS1-6. Construct explanations and revise, as needed, based on evidence for 1) how carbon, hydrogen, and oxygen from sugar molecules 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.** *Ex. glucose, amino acid, DNA, hydrocarbons, etc.* **Level III Students will:** **Construct models of carbon-based molecules.** *Ex. glucose, amino acid, DNA, hydrocarbons, etc.* **Level II Students will:** **Recognize a model of a carbon-based molecule.** *Ex. glucose vs salt* **Level I Students will:** **Attend to the construction of a model of a carbon-based molecule.**

LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of sugar molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration. The term "molecules" is synonymous with "food" in other grade level bands.	**SES-HS-LS1-7. Use a model to demonstrate that energy can be transferred through breaking and forming bonds.**	**Level IV Students will:** **Create a model that illustrates cellular respiration.** *Ex.*  *(Photo by: Mikael Häggström)* **Level III Students will:** **Use a model to demonstrate that energy can be transferred through breaking and forming bonds.** **Level II Students will:** **Recognize that energy is transferred through breaking and forming bonds.** **Level I Students will:** **Attend to a lesson about the breaking and forming of bonds.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition in the Rocky Mountain region. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical, regional, or current data sets.	**SES-HS-LS2-1. Describe how the population of a species changes in relation to the availability of resources.**	**Level IV Students will:** **Use a model to explain how changes in the population of species affect the carrying capacity of an ecosystem.** **Level III Students will:** **Describe how the population of a species changes in relation to the availability of resources.** *Ex. When more water is present more species are present.* *Ex: When more food is available, populations grow.* **Level II Students will:** **Identify a factor that affects change on an ecosystem and how it can increase/decrease available resources.** *Ex. Drought decreases species distribution.* **Level I Students will:** **Given two illustrations or manipulatives, identify which one is found in an ecosystem (living vs. nonliving).** *Ex. ball vs. plant*
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. Revision refers to the scientific practice of modifying explanations using additional data analysis and/or research.	**SES-HS-LS2-2. Identify factors that affect biodiversity in different environments.**	**Level IV Students will:** **Create a model demonstrating factors affecting biodiversity and compare the difference in population numbers.** **Level III Students will:** **Identify factors that affect biodiversity in different environments.** *Ex. amount of rainfall, number of hours of sunlight, temperature, etc.* **Level II Students will:** **Identify which environments have higher, or lower, biodiversity.** *Ex. Picture of the rainforest with organisms vs. picture of the tundra with organisms. Student identifies the rainforest as having higher biodiversity.* **Level I Students will:** **Attend to lessons about biodiversity.**

LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS2-3. Construct an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions, and revise as needed. Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments. Examples could include bioremediation of hydrocarbons or other materials, sewage / waste treatment, or decomposition.	**SES-HS-LS2-3. Construct models of matter and energy cycles.**	**Level IV Students will:** **Construct and compare models of matter and energy cycles.** **Level III Students will:** **Construct models of matter and energy cycles.** **Level II Students will:** **Use a model to answer questions about matter and energy cycles.** **Level I Students will:** **Attend to a discussion of matter and energy cycles.**
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen, and nitrogen being conserved as they move through an ecosystem.	**SES-HS-LS2-4. Integrated in SES-HS-LS2-3.**	**Not applicable.**
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	**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:** **Construct a model of the carbon cycle to include interaction with the atmosphere.** **Level II Students will:** **Label the parts of the carbon cycle.** *Ex. Place labels on a pre-made diagram.* **Level I Students will:** **Attend to a lesson about the role animals play in the carbon cycle.**

LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Link to virtual lab* **Level III Students will:** **Demonstrate how a change in conditions can change an ecosystem.** *Ex.Link to virtual lab* **Level II Students will:** **Recognize factors that can affect changes on an ecosystem.** *Ex.* hunting, flooding, volcanic eruption, rise of sea level, etc. **Level I Students will:** **Recognize a factor that can affect change**. *Ex. turning on a heat lamp will warm an area*
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.** *Ex. Pollution causes contamination of water.* *Ex: Tornados or fires destroy forests.* **Level I Students will:** **Observe impacts on the environment.** *Ex. litter, volcano, floods, pollution, etc.*
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.	**SES-HS-LS2-8. Identify organisms that demonstrate group behaviors.**	**Level IV Students will:** **Identify why organisms demonstrate certain behaviors and how it affects their group.** *Ex. sheep in flocks for safety, fish in schools for safety, wolves in packs for hunting, etc.* **Level III Students will:** **Identify organisms that demonstrate group behaviors.** *Ex. sheep in flocks, fish in schools, wolves in packs, etc.* **Level II Students will:** **Distinguish between group and individual behavior.** *Ex. schools of fish vs an individual octopus; geese that fly in v-formation vs an individual eagle* **Level I Students will:** **Observe group behavior.**

LS3 – Heredity: Inheritance and Variation of Traits

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	**SES-HS-LS3-1. Identify traits that are passed from parent to offspring.**	**Level IV Students will:** **Identify DNA as a code for passing traits from parent to offspring.** **Level III Students will:** **Identify traits that are passed from parent to offspring.** *Ex. seed color, hair color, eye color, etc.* **Level II Students will:** **Identify parent and offspring combinations.** *Ex. horse and a colt* **Level I Students will:** **Attend to a lesson about traits that are passed from parent to offspring.**
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.** *Ex. PhET animation of natural selection.* *Ex. Link to interactive simulation on Natural Selection* **Level III Students will:** **Demonstrate that mutations can occur in DNA.** *Ex. Pull a piece from a DNA model or change the model in some way.* **Level II Students will:** **Recognize the physical effect of a genetic mutation.** *Ex. webbed fingers vs. non-webbed* **Level I Students will:** **Attend to a lesson about DNA mutation.**
HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.	**SES-HS-LS3-3.** *****The Extended Standards Educator Committee determined there are not relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

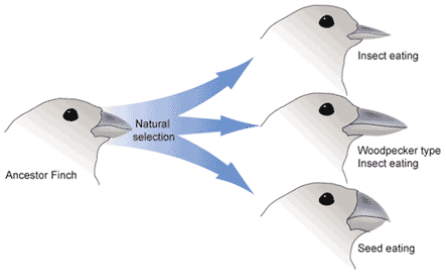
LS4 – Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. **C**larification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, biochemical similarities, and order of appearance of structures in embryological development.	**SES-HS-LS4-1. Construct a model demonstrating lineage from an ancient extinct animal to a modern animal.**	**Level IV Students will:** **Construct a model demonstrating adaptations from an ancient extinct animal to a modern animal.** **Level III Students will:** **Construct a model demonstrating lineage from an ancient extinct animal to a modern animal.** *Ex. horse lineage* **Level II Students will:** **Match a common ancestor to a living organism.** *Ex. A mammoth to an elephant.* **Level I Students will:** **Attend to the construction of a model demonstrating lineage from an ancient extinct animal to a modern animal.**
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 of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.	**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.** *Ex. Link to interactive simulation on Natural Selection* *Ex. Link to virtual lab* **Level III Students will:** **Demonstrate how a population can adapt to survive.** *Ex. As an environment changes from hot to cold, individuals with thicker coats will survive to reproduce while thinner coats will die off, making it more likely that the thicker coated individuals are being produced.* **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.** *Ex. I am cold, therefore I should put on my coat.*

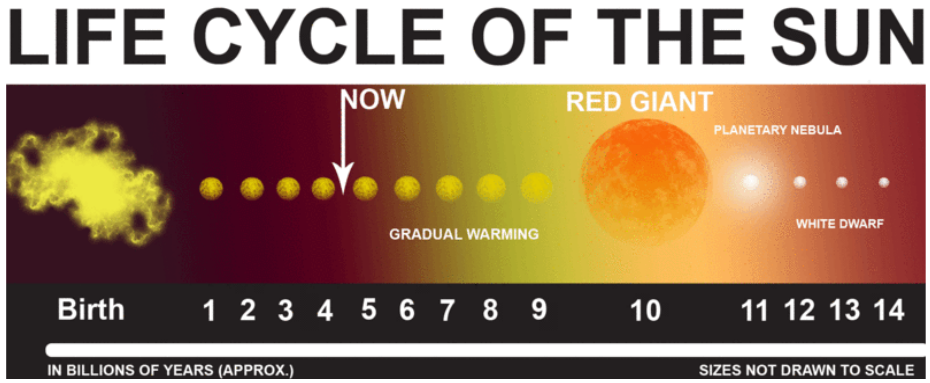
LS4 – Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations. Further development may include allele frequency calculations.	**SES-HS-LS4-3.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term change in climate, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.	**SES-HS-LS4-4. Demonstrate how a population can change based on natural selection.**	**Level IV Students will:** **Explain how the population can change, over time, based on natural selection**. *Ex. Link to virtual lab* *Ex. Link to interactive simulation on Natural Selection* *Ex. Link to virtual lab on Natural Selection* **Level III Students will:** **Demonstrate how a population can change based on natural selection.** *Ex. Peacocks with more eye feathers will be selected to reproduce over less colorful males. .Link to Storyboard on Natural Selection of Colorful Peacocks* **Level II Students will:** **Given two examples, identify the population that has experienced a positive adaptation.** **Level I Students will:** **Attend to a lesson about population change based on natural selection.**

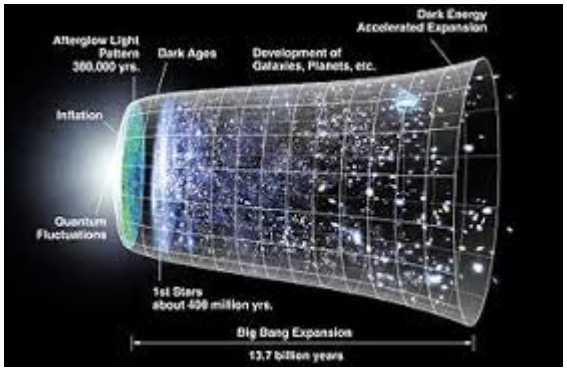
LS4 – Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Link to virtual lab on How Birds Adapt to their Habitat?* **Level III Students will:** **Using evidence indicate the emergence of a new species over time.** *Ex.*  *(Photo from: the National Human Genome Research Institute's Talking Glossary)* **Level II Students will:** **Given an adaptation vs. non-adaptation, select the item that demonstrates the adaptation.** *Ex. Chameleons change skin color to hide in surroundings.* **Level I Students will:** **Given an adaptation, select the environmental condition that would cause it.** *Ex. Provided pictures of hot and cold environments, choose the one that would make you put on your coat.*
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.** *Ex: Cutting down rainforest kills toucans.* **Level III Students will:** **Observe and describe the impacts of human activity on biodiversity.** *Ex. Link to Human Impact on the Environment* **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.**

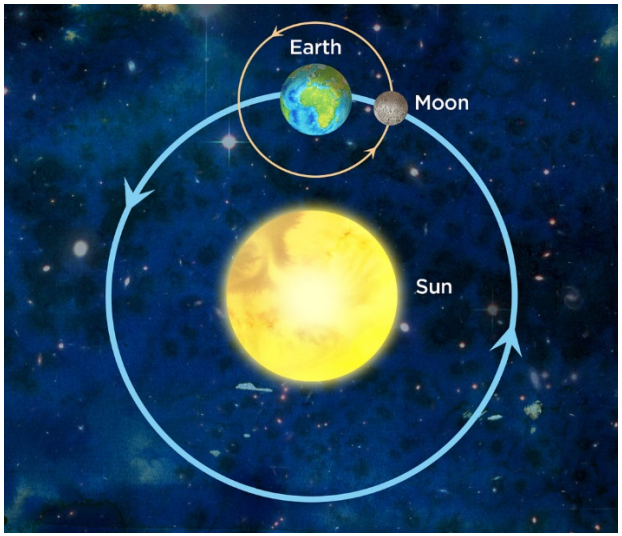
ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11- year sunspot cycle, and non-cyclic variations over centuries.	**SES-HS-ESS1-1. Construct a model to illustrate the life span of the sun.**	**Level IV Students will:** **Construct a model to illustrate the life span of the sun, including the role of fusion.** *Ex. Energy comes from the fusion of elements in the core of the sun.* *Link to the Life Cycle of Stars* **Level III Students will:** **Construct a model to illustrate the life span of the sun.** *Ex.*  *(Photo by: Unuplusunu)* **Level II Students will:** **Arrange a model of the sun's life cycle in chronological order.** **Level I Students will:** **Recognize that the sun keeps us warm.**

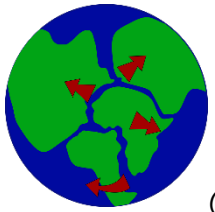
ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex.Link to Big Bang Activity* **Level III Students will:** **Construct a model of the expanding Universe.** *Ex. Place 2 dots on a balloon and blow it up to demonstrate the expansion. Link to the Expanding Universe* **Level II Students will:** **Identify a model that illustrates the Big Bang theory.** *Ex.*  *(Photo from: NASA/WMAP Science Team)* **Level I Students will:** **Attend to a model of the expanding Universe.**
HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.	**SES-HS-ESS1-3. Compare life cycles of other stars to our sun.**	**Level IV Students will:** **Compare life cycles of other stars to our sun including the elements that are produced in each star.** **Level III Students will:** **Compare life cycles of other stars to our sun.** *Ex. Red Giants vs Main Sequence vs White Dwarf Stars* **Level II Students will:** **Recognize that our sun is a star.** **Level I Students will:** **Attend to a comparison of the life cycles of stars.**

ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as natural solar system objects.	**SES-HS-ESS1-4. Use a simulation to represent the motion of orbiting objects in the solar system.**	**Level IV Students will:** **Demonstrate an understanding of how gravity affects the orbit of objects in the solar system.** **Level III Students will:** **Use a simulation to represent the motion of orbiting objects in the solar system.** *Ex. Link to interactive simulation on Gravity and Orbits* **Level II Students will:** **Participate in the motion of orbits.** *Ex.*  *(Photo from: Slyavula Education)* **Level I Students will:** **Attend to a simulation of orbits.**

ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions).	**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.** *Ex. Snickers lab (student demonstrates movement of plate tectonics)* *Ex. Link to SEPUP Plate Motion simulation*  *(Photo from: Pixabay)* **Level II Students will:** **Use a model to identify earth's current continental formations.** *Ex. A map with raised mountains.* **Level I Students will:** **Given picture(s) or models, determine which is land and which is water.**
HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest rocks), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.	**SES-HS-ESS1-6. From a model, construct an account of Earth's formation and early history.**	**Level IV Students will:** **Construct, and label, a model of the formation of the Earth.** **Level III Students will:** **From a model, construct an account of Earth's formation and early history.** *Ex. Given pictures, arrange in order, steps in the formation of the Earth.* **Level II Students will:** **Identify evidence of objects which impact the formation of the earth.** *Ex. meteorites* **Level I Students will:** **Attend to an exploration of the formation of the Earth.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion). Focus on the varying rates of process.	**SES-HS-ESS2-1. Construct a model that demonstrates the formation of valleys and mountains.**	**Level IV Students will:** **Construct, and explain, a model that demonstrates the formation of valleys and mountains.** **Level III Students will:** **Construct a model that demonstrates the formation of valleys and mountains.** *Ex.* Link to a picture of a model demonstrating valleys and mountains *Ex. a play-dough model of mountains and valleys* **Level II Students will:** **Identify valleys and mountains.** **Level I Students will:** **Attend to a demonstration showing a valley and a mountain.**
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.** *Ex. Earthquake in one area, causing a lake to form where there was once a river, could cause drought where the river previously flowed.* *Ex. Hebgen Lake in Idaho (1959)* **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.**

ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.	**SES-HS-ESS2-3. Construct a model of the Earth's interior.**	**Level IV Students will:** **Construct, label, and explain, a model of the Earth's interior.** **Level III Students will:** **Construct a model of the Earth's interior.** *Ex. ball with layers of playdough* *Ex. peach cross-section* **Level II Students will:** **Identify the core, and the crust, on a cross-section representation of the Earth.** **Level I Students will:** **Attend to the construction of a model of the Earth's interior.**
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 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.	**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.** *Ex. rising ocean temperature, evaluating how ocean currents effect weather patterns, etc.* **Level III Students will:** **Use a model to identify changes in the flow of energy that can change the climate.** *Ex. Identify what happens when volcanic ash blocks out the sun's rays.* **Level II Students will:** **Identify energy changes that can change the climate.** *Ex. large volcanic eruptions* **Level I Students will:** **Attend to the construction of a model demonstrating changes in the flow of energy that can change the climate.**

ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). Emphasis could be on local, regional and Wyoming state hydrological resources and features.	**SES-HS-ESS2-5. Construct a model depicting how water in the form of ice, liquid, and/or gas has changed the landscape.**	**Level IV Students will:** **Construct, and label, a model depicting how water in the form of ice, liquid, and/or gas has changed the landscape.** **Level III Students will:** **Construct a model depicting how water in the form of ice, liquid, and/or gas has changed the landscape.** *Ex. Expedition Yellowstone: Box with soil/sand that students pour water on and place ice cubes to model how water can change Earth's surface.* *Link to information on landforms created by glaciers* *Ex. Link to interactive simulation on Glaciers* **Level II Students will:** **Identify pictures/diagrams of how water has changed the landscape.** *Ex. pictures of the Grand Canyon* **Level I Students will:** **Attend to a lesson of how water in the form of ice, liquid, and/or gas has changed the landscape.**
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.	**SES-HS-ESS2-6. Integrated in SES-HS-LS2-5.**	**Not applicable.**

ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.	**SES-HS-ESS2-7. Explain how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.**	**Level IV Students will:** **Use evidence to explain how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.** **Level III Students will:** **Explain how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.** *Ex. After a volcanic eruption, how would life adapt?* *Ex. How did life adapt to changes in the atmosphere?* *Ex. How did life adapt to ice ages?* **Level II Students will:** **Identify pictures/diagrams of how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.** **Level I Students will:** **Attend to a demonstration of how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.**

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.	**SES-HS-ESS3-1. Demonstrate how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.**	**Level IV Students will:** **Research an event that illustrates how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.** **Level III Students will:** **Demonstrate how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.** *Ex. The immigration of miners, trappers, etc. to different parts of the country.* **Level II Students will:** **Identify an event that illustrates how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.** **Level I Students will:** **Attend to a discussion of an event that illustrates how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.**
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.** *Ex. How will opening or closing mines affect the environment and the people in the area?* **Level III Students will:** **From factors provided, select which factors need to be considered, prior to developing energy or mineral resources.** *Ex. Sage grouse habitat destruction vs improved grazing areas.* *Ex. Water source contamination vs. improved water quality.* **Level II Students will:** **Identify various energy or mineral resources.** *Ex. coal, oil, natural gas, wind farms* **Level I Students will:** **Attend to an exploration of various energy and mineral resources.** *Ex. Student visits a gas station and observes a car being fueled.* *Ex. Student observes or holds a piece of coal.* *Ex. Student visits a wind farm.*

ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS3-3. Use ~~a~~ 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. Integrated in SES-HS-ESS3-2.** **The management factors of natural resources was addressed in the previous standard.**	**Not applicable.**
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Technological solutions to evaluate could include landscape reclamation, reducing, reusing, and recycling resources, emission control systems, or evaporation control. Examples for limiting future impacts could range from local efforts to large-scale design solutions.	**SES-HS-ESS3-4. Construct a model of a technological solution that reduces impacts of human activities on natural systems.**	**Level IV Students will:** **Construct, and label, a model of a technological solution that reduces impacts of human activities on natural systems.** **Level III Students will:** **Construct a model of a technological solution that reduces impacts of human activities on natural systems.** *Ex. Create a storyboard that depicts landscape reclamation.* *Ex. Create a recycling center in their room or school.* *Ex. Create a model of a car muffler.* **Level II Students will:** **Identify a model of a technological solution that reduces impacts of human activities on natural systems.** **Level I Students will:** **Explore examples of technological solutions that reduce impacts of human activities on natural systems.** *Ex. Visit the local recycling center.* *Ex. Visit the school auto shop and watch a demonstration of how a car's emission control system works.* *Ex. Visit a mining facility and observe their reclamation activities.*

ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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 change in climate and associated future impacts 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.** *Ex. Compare results from a global climate model if no changes of policy occur vs. if we start recycling, reduce emissions etc.* *Ex. Link to Journey North: Tracking Migrations and Seasons* **Level III Students will:** **Use global climate models to identify global, or regional, change in climate and associated future impacts to Earth systems.** *Ex. Read a graph, determine if the change is positive or negative, and predict an impact.* **Level II Students will:** **Use global climate models to identify global or regional change in climate.** *Ex. Journey North website Link to Journey North: Tracking Migrations and Seasons* *Ex. Explore an internet weather site.* **Level I Students will:** **Attend to a presentation about global, or regional, change in climate.**
HS-ESS3-6. Use the results of a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. Consideration should be given to both positive and negative modification results.	**SES-HS-ESS3-6. Use a computational representation to illustrate how changes to the environment affect Earth systems.**	**Level IV Students will:** **Use a computational representation to illustrate, and explain, how changes to the environment affect Earth systems.** **Level III Students will:** **Use a computational representation to illustrate how changes to the environment affect Earth systems.** *Ex. Link to virtual lab on communities and biomes* *Ex. Link to virtual lab on Water Quality* *Ex. Link to virtual lab to investigate When is Water Safe to Drink?* **Level II Students will:** **Identify how changes to the environment affect Earth systems.** **Level I Students will:** **Attend to a computational representation which illustrates how changes to the environment affect Earth systems.**

ETS1: Engineering, Technology & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ETS1-1. Analyze a local, regional, or global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. Clarification Statement: Examples of challenges could include rural cell phone coverage, geothermal energy use, and sage grouse population.	**SES-HS-ETS1-1. Identify a local, regional, or global challenge for solutions that account for societal needs and wants.**	**Level IV Students will:** **Research a local, regional, or global challenge for solutions that account for societal needs and wants.** *Ex. The effect of the eclipse influx on local infrastructures.* **Level III Students will:** **Identify a local, regional, or global challenge for solutions that accounts for societal needs and wants.** *Ex. Compare maps of cell coverage from different cell phone companies and point out problems with coverage.* **Level II Students will:** **Identify a challenge in their lives that affects their needs and wants and propose a solution.** *Ex. I am cold, so I should put on my coat.* **Level I Students will:** **Identify a challenge in their lives that affects their needs and wants.** *Ex. Develop a communication signal for when they are cold.*
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Clarification Statement: Emphasis is on creativity, innovation, and inquiry.	**SES-HS-ETS1-2. Identify a solution to a real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**	**Level IV Students will:** **Propose a solution to a real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.** *Ex. Write a letter to the city council proposing recycling containers.* **Level III Students will:** **Identify a solution to a real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.** *Ex. If we provide recycling containers on our city streets, then people will recycle more.* **Level II Students will:** **Identify a solution to a problem that personally affects them by breaking it down into smaller, more manageable problems that can be solved through engineering.** *Ex. I can bring all the groceries in from the car in one trip if I gather all the bag handles together and put them over my arm.* **Level I Students will:** **Participate in the act of solving a problem.** *Ex. Putting books in a backpack to carry more easily.*

ETS1: Engineering, Technology & Applications of Science (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ETS1-3. Evaluate a solution to a real-world problem based on 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.	**SES-HS-ETS1-3. 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 IV Students will:** **Identify a solution to a real-world problem based on 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.** *Ex. Make a list of pro and con solutions and put them in order from best to worst.* **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.** *Ex. Make a list of possible solutions to a problem such as air pollution.* **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.** *Ex. Identify solutions to having a flat tire.* **Level I Students will:** **Identify a solution to a problem that personally affects them and develop a consistent positive response.** *Ex. When I am hungry, I will communicate this to someone who can assist me (verbally, communication board, etc.).*
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. Clarification Statement: Examples can include using spreadsheets to modify and evaluate data, PhET simulations, GIS spatial modeling, etc.	**SES-HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a real-world problem.**	**Level IV Students will:** **Use a computer simulation to model the impact of two or more proposed solutions to a real-world problem.** **Level III Students will:** **Use a computer simulation to model the impact of a proposed solution to a real-world problem.** *Ex. Create a video illustrating the impacts of a solution and insert it into a PowerPoint presentation.* *Ex. Use existing computer simulations such as: Link to virtual lab on Communities and Biomes* *Ex. Link to virtual lab on Assessing Water Quality* *Ex. Link to virtual lab investigating When is Water Safe to Drink?* **Level II Students will:** **With guidance and support, create a simulation to model the impact of proposed solutions to a problem that affects their personal environment.** *Ex. Create a video or presentation about solutions to a problem in their personal environment.* **Level I Students will:** **Attend to a simulation which models the impact of proposed solutions to a problem that affects their personal environment.**

ETS1: Engineering, Technology & Applications of Science (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
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.** *Ex. Peer-reviewed journals vs online blogs.* **Level III Students will:** **Given reliable materials, identify valid vs. invalid claims.** *Ex. Analyzing types of websites like .com vs .edu.* *Ex: Claims supported by data collected in controlled experiments vs claims with no experimental support.* **Level II Students will:** **Identify a truth vs. a lie.** *Ex. Goldilocks has blond hair vs Goldilocks has black hair.* *Ex. The sky is blue vs. the sky is purple.* **Level I Students will:** **Identify real vs. not real.** *Ex. plastic vs. real apple*