

2020 Wyoming Science Performance Level Descriptors (PLDs)

Companion document to the [2016 Science Content Standards](#)

Kindergarten Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions – Not present in Kindergarten

PS2 Motion and Stability: Forces and Interactions

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.

- In addition to Proficient, the **Advanced** student is able to gather additional evidence to support understanding by creating a different investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.
- The **Proficient** student is able to with guidance, plan and conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.
- The **Basic** student is able to, with guidance, plan or conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to, after analyzing data from multiple tests, show and compare different design solutions to determine if they work as intended to change the speed or direction of an object with a push or a pull.
- The **Proficient** student is able to 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.
- The **Basic** student is able to, with guidance and support, 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.
- The **Below Basic** student does not meet the Basic performance level.

PS3 Energy

K-PS3-1 Make observations to determine the effect of sunlight on Earth's surface.

- In addition to Proficient, the **Advanced** student is able to use observations to explain patterns in how sunlight warms the Earth's surface.
- The **Proficient** student is able to make observations to determine patterns in how sunlight warms the Earth's surface.
- The **Basic** student is able to observe that sunlight warms the earth's surface.
- The **Below Basic** student does not meet the Basic performance level.

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K-PS3-2 Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

- In addition to Proficient, the **Advanced** student is able to use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area and evaluate the effectiveness of the structure.
- The **Proficient** student is able to use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.
- The **Basic** student is able to identify a structure or object that reduces the warming effect of sunlight on an area.
- The **Below Basic** student does not meet the Basic performance level.

PS4 Waves and their Applications in Technologies for Information Transfer – Not present in Kindergarten

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.

- In addition to Proficient, the **Advanced** student is able to use observations to describe patterns of matter and energy which plants and animals need to survive and explain how matter and energy help plants and animals survive.
- The **Proficient** student is able to use observations to describe patterns of matter and energy plants and animals (including humans) need to survive.
- The **Basic** student is able to identify plant and animal needs.
- The **Below Basic** student does not meet the Basic performance level.

LS2 Ecosystems: Interactions, Energy, and Dynamics – Not present in Kindergarten

LS3 Heredity: Inheritance and Variation of Traits – Not present in Kindergarten

LS4 Biological Evolution: Unity and Diversity – Not present in Kindergarten

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe – Not present in Kindergarten

ESS2 Earth's Systems

K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.

- In addition to Proficient, the **Advanced** student is able to use and share observations of local weather conditions to describe patterns over time and use evidence to predict future weather patterns.
- The **Proficient** student is able to use and share observations of local weather conditions to describe patterns over time.
- The **Basic** student is able to identify local weather conditions.
- The **Below Basic** student does not meet the Basic performance level.

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K-ESS2-2 Use and share observations of local weather conditions to describe patterns over time.

- In addition to Proficient, the **Advanced** student is able to construct an argument to support a claim that plants and animals can change the environment to meet their needs, and explain how those changes impact other plants and animals in the system.
- The **Proficient** student is able to construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
- The **Basic** student is able to identify that plants and animals can change the environment.
- The **Below Basic** student does not meet the Basic performance level.

ESS3 Earth and Human Activity

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.

- In addition to Proficient, the **Advanced** student is able to create a model to explain the relationship between the needs of different plants and animals (including humans) and the places they live.
- The **Proficient** student is able to use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
- The **Basic** student is able to recognize plants and animals (including humans) have a relationship between their needs and the places they live.
- The **Below Basic** student does not meet the Basic performance level.

K-ESS3-2 Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

- In addition to Proficient, the **Advanced** student is able to compare and contrast ways to prepare for, and respond to, severe weather in local communities.
- The **Proficient** student is able to ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.
- The **Basic** student is able to ask questions about severe weather.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate solutions that manage the impact of humans on the land, water, air, and/or other living things in the local environment.
- The **Proficient** student is able to communicate solutions that will manage the impact of humans on the land, water, air, and/or other living things in the local environment.
- The **Basic** student is able to identify the impact of humans on the land, water, air, and/or other living things in the local environment.
- The **Below Basic** student does not meet the Basic performance level.

4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

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- In addition to Proficient, the **Advanced** student is able to ask questions, make observations, and gather information about a situation people want to change to define a simple problem and determine more than one potential solution to the problem through the development of new or improved objects or tools.
- The **Proficient** student is able to ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved that can be solved through the development of a new or improved object or tool.
- The **Basic** student is able to ask questions and make observations about a situation people want to change through the development of a new or improved object or tool.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to generate and compare multiple sketches, drawings, or physical models to illustrate how the shape of objects helps them function to solve a problem.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe how the shape of an object can help solve a given problem.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation to collect and analyze data from tests of two objects designed to solve the same problem to identify the strengths and weaknesses of how each performs.
- The **Proficient** student is able to analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
- The **Basic** student is able to describe how an object is used to solve a problem.
- The **Below Basic** student does not meet the Basic performance level.

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Grade 1 Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions – Not present in 1st grade

PS2 Motion and Stability: Forces and Interactions – Not present in 1st grade

PS3 Energy – Not present in 1st grade

PS4 Waves and their Applications in Technologies for Information Transfer

1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

- In addition to Proficient, the **Advanced** student is able to use data from investigations to refute or support evidence that different vibrating materials can make different sounds and that sound can make materials vibrate.
- The **Proficient** student is able to plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
- The **Basic** student is able to conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
- The **Below Basic** student does not meet the Basic performance level.

1-PS4-2 Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation to construct an evidence-based account that objects in darkness can be seen only when illuminated.
- The **Proficient** student is able to make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.
- The **Basic** student is able to observe that objects in darkness can be seen only when illuminated.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate different materials and then classify them based on how they will affect the path of a beam of light.
- The **Proficient** student is able to plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
- The **Basic** student, with guidance, conducts investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

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- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to use tools and materials to design and build multiple devices that use light or sound to solve the problem of communicating over a distance.
- The **Proficient** student is able to use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
- The **Basic** student is able to use a device that uses light or sound to solve the problem of communicating over a distance.
- The **Below Basic** student does not meet the Basic performance level.

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

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.

- In addition to Proficient, the **Advanced** student is able to use materials to design and test the effectiveness of 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to compare naturally occurring plant and animal parts to man made products that mimic them.
- The **Below Basic** student does not meet the Basic performance level.

1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

- In addition to Proficient, the **Advanced** student is able to, after reading texts and using media, determine patterns in behavior of parents and offspring that help offspring survive, compare and contrast patterns among different species.
- The **Proficient** student is able to read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
- The **Basic** student, with guidance, is able to read texts and use media to make observations about the behaviors of different animals and their offspring.
- The **Below Basic** student does not meet the Basic performance level.

LS2 Ecosystems: Interactions, Energy, and Dynamics – Not present in 1st grade

LS3 Heredity: Inheritance and Variation of Traits

1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

- In addition to Proficient, the **Advanced** student may be able to, after observing, construct an evidence-based account that young plants and animals are like, but not exactly like, their parents, compare and contrast families or species.
- The **Proficient** student is able to make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

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- The **Basic** student is able to identify how young plants and animals are similar to and different from their parents.
- The **Below Basic** student does not meet the Basic performance level.

LS4 Biological Evolution: Unity and Diversity – Not present in 1st grade

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe

1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.

- In addition to Proficient, the **Advanced** student is able to read texts or use media to explain how patterns of the sun, moon, or stars are used by or impact humans.
- The **Proficient** student is able to use observations of the sun, moon, and stars to describe patterns that can be predicted.
- The **Basic** student is able to use observations of the sun or moon to describe patterns.
- The **Below Basic** student does not meet the Basic performance level.

1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.

- In addition to Proficient, the **Advanced** student is able to make observations how differing amounts of daylight at different times of year impact human behavior.
- The **Proficient** student is able to make observations at different times of year to relate the amount of daylight to the time of year.
- The **Basic** student is able to recognize the amount of daylight can vary.
- The **Below Basic** student does not meet the Basic performance level.

ESS2 Earth's Systems – Not present in 1st grade

ESS3 Earth and Human Activity – Not present in 1st grade

4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to ask questions, make observations, and gather information about a situation people want to change to define a simple problem and determine more than one potential solution to the problem through the development of new or improved objects or tools.
- The **Proficient** student is able to 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.

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- The **Basic** student is able to ask questions and make observations about a situation people want to change through the development of a new or improved object or tool.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to generate and compare multiple sketches, drawings, or physical models to illustrate how the shape of objects helps them function to solve a problem.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe how the shape of an object can help solve a given problem.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation to collect and analyze data from tests of two objects designed to solve the same problem to identify the strengths and weaknesses of how each performs.
- The **Proficient** student is able to analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
- The **Basic** student is able to describe how an object is used to solve a problem.
- The **Below Basic** student does not meet the Basic performance level.

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Grade 2 Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation on the properties of materials to determine the effectiveness of the materials to solve a problem.
- The **Proficient** student is able to plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- The **Basic** student is able to conduct an investigation to describe and classify different kinds of materials by their observable properties.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to design and/or create a new product using materials that have properties that are best suited for an intended purpose.
- The **Proficient** student is able to analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- The **Basic** student is able to select a material that is best suited for an intended purpose based on the properties.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to explain that, compared to the original object, the new object or objects can have different characteristics, even though they were made of the same set of pieces.
- The **Proficient** student is able to 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.
- The **Basic** student is able to disassemble a large object and make a new object from the same set of pieces.
- The **Below Basic** student does not meet the Basic performance level.

2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

- In addition to Proficient, the **Advanced** student is able to apply ideas from previous investigations to plan and conduct an additional investigation to predict what will happen if an object is heated or cooled and whether it can be returned to its original state.

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- The **Proficient** student is able to construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
- The **Basic** student is able to observe that some changes can be caused by heating or cooling.
- The **Below Basic** student does not meet the Basic performance level.

PS2 Motion and Stability: Forces and Interactions – Not present in 2nd grade

PS3 Energy – Not present in 2nd grade

PS4 Waves and their Applications in Technologies for Information Transfer – Not present in 2nd grade

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes – Not present in 2nd grade

LS2 Ecosystems: Interactions, Energy, and Dynamics

2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation testing how variable amounts of sunlight and water affects plant growth.
- The **Proficient** student is able to plan and conduct an investigation to determine if plants need sunlight and water to grow.
- The **Basic** student is able to conduct an investigation to determine if plants need sunlight and water to grow.
- The **Below Basic** student does not meet the Basic performance level.

2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

- In addition to Proficient, the **Advanced** student is able to construct a model that mimics the function of an animal in dispersing seeds or pollinating plants and evaluate the effectiveness of its function.
- The **Proficient** student is able to develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- The **Basic** student is able to identify ways animals can either disperse seeds or pollinate plants.
- The **Below Basic** student does not meet the Basic performance level.

LS3 Heredity: Inheritance and Variation of Traits – Not present in 2nd grade

LS4 Biological Evolution: Unity and Diversity

2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.

- In addition to Proficient, the **Advanced** student is able to make observations of plants and animals to compare the diversity of life in different habitats and explain how different characteristics help them survive in their habitats.
- The **Proficient** student is able to make observations of plants and animals to compare the diversity of life in different habitats.
- The **Basic** student is able to make observations to identify that plants and animals have different habitats.

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- The **Below Basic** student does not meet the Basic performance level.

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe

2-ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

- In addition to Proficient, the **Advanced** student is able to explain that slow and quick are relative terms; classify global and local earth events based on the rates of change, and defend the classification of the events.
- The **Proficient** student is able to use information from several sources to provide evidence that Earth events can occur quickly or slowly.
- The **Basic** student is able to classify Earth events as either slow or quick.
- The **Below Basic** student does not meet the Basic performance level.

ESS2 Earth's Systems

2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

- In addition to Proficient, the **Advanced** student is able to evaluate multiple solutions to determine the most effective design that prevents wind or water from changing the shape of the land.
- The **Proficient** student is able to compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- The **Basic** student is able to identify a solution designed to slow or prevent wind or water from changing the shape of the land.
- The **Below Basic** student does not meet the Basic performance level.

2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.

- In addition to Proficient, the **Advanced** student is able to use models of two or more areas to identify patterns of different types of land and bodies of water.
- The **Proficient** student is able to develop a model to represent the shapes and kinds of land and bodies of water in an area.
- The **Basic** student is able to describe the shapes and kinds of land and bodies of water.
- The **Below Basic** student does not meet the Basic performance level.

2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid, liquid, or gas.

- In addition to Proficient, the **Advanced** student is able to synthesize and communicate information to describe how water travels and changes phases.
- The **Proficient** student is able to obtain information to identify where water is found on Earth and that it can be solid, liquid, or gas.
- The **Basic** student is able to recognize that water can exist in 3 phases: solid, liquid, and gas.
- The **Below Basic** student does not meet the Basic performance level.

ESS3 Earth and Human Activity – Not present in 2nd grade

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4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to ask questions, make observations, and gather information about a situation people want to change to define a complex problem and determine more than one potential solution to the problem through the development of new or improved objects or tools.
- The **Proficient** student is able to 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.
- The **Basic** student is able to ask questions and make observations about a situation people want to change through the development of a new or improved object or tool.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to generate and compare multiple sketches, drawings, or physical models to illustrate how the shape of objects helps them function to solve a problem.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe how the shape of an object can help solve a given problem.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation to collect and analyze data from tests of two objects designed to solve the same problem to identify the strengths and weaknesses of how each performs.
- The **Proficient** student is able to analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
- The **Basic** student is able to describe how an object is used to solve a problem.
- The **Below Basic** student does not meet the Basic performance level.

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Grade 3 Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions – Not present in 3rd grade

PS2 Motion and Stability: Forces and Interactions

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.

- In addition to Proficient, the **Advanced** student is able to plan, conduct, and revise an investigation to provide evidence of the effects of balanced and unbalanced forces on motion of an object.
- The **Proficient** student is able to plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- The **Basic** student is able to conduct an investigation of the effects of forces on the motion of an object.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to synthesize and communicate observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- The **Proficient** student is able to make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- The **Basic** student is able to describe that an object's motion provides evidence that a pattern can be used to predict future motion.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to predict and provide evidence to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- The **Proficient** student is able to ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- The **Basic** student is able to identify a cause and effect relationship of electric or magnetic interactions between two objects not in contact with each other.
- The **Below Basic** student does not meet the Basic performance level.

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3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.

- In addition to Proficient, the **Advanced** student is able to define a multi-part design problem that can be solved by applying scientific ideas about magnets.
- The **Proficient** student is able to define a simple design problem that can be solved by applying scientific ideas about magnets.
- The **Basic** student is able to identify ways that magnets are used to solve problems.
- The **Below Basic** student does not meet the Basic performance level.

PS3 Energy – Not present in 3rd grade

PS4 Waves and their Applications in Technologies for Information Transfer – Not present in 3rd grade

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

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.

- In addition to Proficient, the **Advanced** student is able to research and evaluate a solution to a problem involving a disruption in an animal's life cycle.
- The **Proficient** student is able to develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
- The **Basic** student is able to develop a model to show organisms have life cycle patterns.
- The **Below Basic** student does not meet the Basic performance level.

LS2 Ecosystems: Interactions, Energy, and Dynamics

3-LS2-1 Construct an argument that some animals form groups that help members survive.

- In addition to Proficient, the **Advanced** student is able to evaluate the behaviors of different groups of animals, of various sizes, on how well they obtain food, defend themselves, and cope with changes to support or refute an argument that some animals form groups that help members survive.
- The **Proficient** student is able to construct an argument that some animals form groups that help members survive.
- The **Basic** student is able to identify some animals that form groups to help them survive.
- The **Below Basic** student does not meet the Basic performance level.

LS3 Heredity: Inheritance and Variation of Traits

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.

- In addition to Proficient, the **Advanced** student is able to analyze and critique data to develop an argument which explains that plants and animals have traits inherited from parents, and identify trait(s) that are beneficial, detrimental, or neutral to the offspring.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify variations of traits in plants and animals inherited from parents that cause a difference in how they look and function.

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- The **Below Basic** student does not meet the Basic performance level.

3-LS3-2 Use evidence to support the explanation that observable traits can be influenced by the environment.

- In addition to Proficient, the **Advanced** student is able to analyze evidence to defend an argument that an organism's observable traits can be influenced by changes in the environment.
- The **Proficient** student is able to use evidence to support the explanation that observable traits can be influenced by the environment.
- The **Basic** student is able to examine evidence that an organism's observable traits can be influenced by the environment.
- The **Below Basic** student does not meet the Basic performance level.

LS4 Biological Evolution: Unity and Diversity

3-LS4-1 Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

- In addition to Proficient, the **Advanced** student is able to analyze and interpret data from fossils to find patterns that indicate environments that can be found in many different locations.
- The **Proficient** student is able to analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
- The **Basic** student is able to examine data from fossils to show that plants, animals, and environments have changed over time.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to defend or refine an argument (based on the evaluation of appropriate evidence, data, or model) that differences in traits within a species can positively or negatively affect animal or plant survival, growth, and reproduction.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify how the variations in characteristics among individuals of the same species may provide advantages.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to construct an argument with evidence that compares and contrasts how changes in an environment impact how some organisms can survive well, some survive less well, and some cannot survive at all.
- The **Proficient** student is able to 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.
- The **Basic** student is able to explain why an organism can or cannot survive in a particular habitat.
- The **Below Basic** student does not meet the Basic performance level.

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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.

- In addition to Proficient, the **Advanced** student is able to construct an argument comparing the merits of multiple solutions to a problem caused when the environment changes and the types of plants and animals that live there may change.
- The **Proficient** student is able to 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.
- The **Basic** student is able to explain a solution to a problem caused by an environmental change.
- The **Below Basic** student does not meet the Basic performance level.

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe – Not present in 3rd grade

ESS2 Earth's Systems

3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

- In addition to Proficient, the **Advanced** student is able to interpret the data provided to create tables and graphs that describe typical weather conditions and patterns expected during a particular season and use the representations to make predictions about future weather.
- The **Proficient** student is able to represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
- The **Basic** student is able to use data from tables to describe typical weather conditions and patterns expected during a particular season.
- The **Below Basic** student does not meet the Basic performance level.

3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.

- In addition to Proficient, the **Advanced** student is able to obtain and combine information to describe climates in different regions of the world and compare and contrast the extent to which weather conditions vary over years.
- The **Proficient** student is able to obtain and combine information to describe climates in different regions of the world.
- The **Basic** student is able to describe climates in different regions of the world.
- The **Below Basic** student does not meet the Basic performance level.

ESS3 Earth and Human Activity

3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

- In addition to Proficient, the **Advanced** student is able to design or improve a solution (e.g., device, construction, or procedure) and explain how this will help to reduce the impacts of a weather-related hazard.
- The **Proficient** student is able to make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
- The **Basic** student is able to identify a design solution that reduces the impacts of a weather-related natural hazard.
- The **Below Basic** student does not meet the Basic performance level.

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4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to develop alternative solutions to a simple design problem and evaluate the effectiveness of each solution.
- The **Proficient** student is able to define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost
- The **Basic** student is able to describe a simple design problem reflecting a need or a want.
- The **Below Basic** may be able to match designs to needs or wants.

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.

- In addition to Proficient, the **Advanced** student is able to research and communicate with peers about possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem under a range of likely conditions.
- The **Proficient** student is able to generate and compare possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- The **Basic** student is able to identify possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- The **Below Basic** student may be able to identify a solution to a given 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.

- In addition to Proficient, the **Advanced** student is able to evaluate fair tests of a variety of solutions in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved and test improvements for effectiveness.
- The **Proficient** student is able to plan and carry out fair tests of a variety of solutions in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
- The **Basic** student is able to carry out a fair test in which variables are controlled.
- The **Below Basic** student may be able to identify variables in an investigation.

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Companion document to the [2016 Science Content Standards](#)
Grade 4 Science is assessed on WY-TOPP 2022+ - see [Science Blueprint](#)

Grade 4 Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions – Not present in 4th grade

PS2 Motion and Stability: Forces and Interactions – Not present in 4th grade

PS3 Energy

4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.

- In addition to Proficient, the **Advanced** student is able to compare and contrast explanations describing the relationship of an object's speed and its energy.
- The **Proficient** student is able to use evidence to construct an explanation relating the speed of an object to the energy of that object.
- The **Basic** student is able to identify the relationship between the speed of an object and the energy of the object.
- The **Below Basic** student may be able to identify that objects have speed and energy.

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

- In addition to Proficient, the **Advanced** student is able to use observations to explain how energy can be transferred from place to place by sound, light, heat, and electric currents.
- The **Proficient** student is able to make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- The **Basic** student is able to make observations of energy being transferred from place to place by sound, light, heat, and electric currents.
- The **Below Basic** student may be able to recognize that energy can be transferred from place to place.

4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.

- In addition to Proficient, the **Advanced** student is able to evaluate questions about the changes in energy that occur when objects collide to determine if they are investigable, and determine the reasonableness of predictions.
- The **Proficient** student is able to ask questions and predict outcomes about the changes in energy that occur when objects collide.
- The **Basic** student is able to predict an outcome when objects collide.
- The **Below Basic** student may be able to describe the effects that occur when objects collide.

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4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

- In addition to Proficient, the **Advanced** student is able to apply scientific ideas to compare and contrast multiple designs of devices that convert energy from one form to another to evaluate the merits of each design by considering the desired features.
- The **Proficient** student is able to apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- The **Basic** student is able to apply scientific ideas to design and test a device that converts energy from one form to another.
- The **Below Basic** student may be able to apply scientific ideas to test a device that converts energy from one form to another.

PS4 Waves and their Applications in Technologies for Information Transfer

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and refine a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- The **Proficient** student is able to develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- The **Basic** student is able to use a model to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- The **Below Basic** student does not meet the Basic performance level.

4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

- In addition to Proficient, the **Advanced** student is able to develop a model to explain how changing conditions affect how objects are seen.
- The **Proficient** student is able to develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- The **Basic** student is able to use a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- The **Below Basic** student may be able to recognize that light reflected from objects allows objects to be seen.

4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.

- In addition to Proficient, the **Advanced** student is able to analyze effectiveness of a pattern or delivery system to transfer information and suggest improvement.
- The **Proficient** student is able to generate and compare multiple solutions that use patterns to transfer information.
- The **Basic** student is able to describe patterns that humans use to transfer information.
- The **Below Basic** student does not meet the Basic performance level.

2020 Wyoming Science Performance Level Descriptors (PLDs)

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

- In addition to Proficient, the **Advanced** student is able to use diagrams, labels and explanations to present an argument that explains how plant and animal structures have adapted to support survival, growth, behavior and reproduction.
- The **Proficient** student is able to construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- The **Basic** student, given examples of external structures of plants and animals, identify how the structures function to support survival and behavior.
- The **Below Basic** student may be able to name different external structures of plants or animals that function to support survival.

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.

- In addition to Proficient, the **Advanced** student is able to design a compare-and-contrast model to explain how two animals receive the same information through their senses, process the information in their brain, and respond to information in different ways.
- The **Proficient** student is able to 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.
- The **Basic** student is able to recognize that animals receive different types of information through their senses and respond to information in different ways.
- The **Below Basic** student may be able to identify an animal's senses.

LS2 Ecosystems: Interactions, Energy, and Dynamics – Not present in 4th grade

LS3 Heredity: Inheritance and Variation of Traits – Not present in 4th grade

LS4 Biological Evolution: Unity and Diversity – Not present in 4th grade

2020 Wyoming Science Performance Level Descriptors (PLDs)

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe

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.

- In addition to Proficient, the **Advanced** student is able to analyze patterns in rock formations and fossils in rock layers to compare and contrast two or more landforms and how they have changed over time.
- The **Proficient** student is able to identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- The **Basic** student is able to describe changes in a landscape over time using rock formations and the presence and location of fossils.
- The **Below Basic** student may be able to recognize that different layers of rock indicate different time periods.

ESS2 Earth's Systems

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.

- In addition to Proficient, the **Advanced** student is able to analyze ways to reduce or change the effects of weathering or the rate of erosion by water, ice, wind, or vegetation on an area and give examples of ways to rehabilitate areas adversely affected by the effects of weathering.
- The **Proficient** student is able to make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- The **Basic** student is able to describe the effects of weathering and/or erosion by water, ice, wind, and/or vegetation.
- The **Below Basic** student may be able to identify ice, water, wind, or vegetation as causes of weathering or erosion.

4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.

- In addition to Proficient, the **Advanced** student is able to develop an explanation describing how, over time, plate tectonics has created multiple patterns of Earth's features.
- The **Proficient** student is able to analyze and interpret data from maps to describe patterns of Earth's features.
- The **Basic** student is able to use maps to describe patterns of Earth's features.
- The **Below Basic** student may be able to identify Earth's features on a map.

ESS3 Earth and Human Activity

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.

- In addition to Proficient, the **Advanced** student is able to use multiple reliable sources of information to predict and explain how changing from one energy source to another energy source can affect the environment in different ways.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify energy sources and fuels and classify them as renewable or nonrenewable resources.

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- The **Below Basic** student does not meet the Basic performance level.

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

- In addition to Proficient, the **Advanced** student is able to design an investigation to test one or more solutions that can reduce the impacts of hazards caused by natural earth processes on humans.
- The **Proficient** student is able to generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- The **Basic** student is able to describe solutions that have been designed to reduce the impact of a hazard caused by natural earth processes on humans.
- The **Below Basic** student may be able to identify the impact of hazards caused by natural earth processes on humans.

4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to develop alternative solutions to a simple design problem and evaluate the effectiveness of each solution.
- The **Proficient** student is able to define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- The **Basic** student is able to describe a simple design problem reflecting a need or a want.
- The **Below Basic** student may be able to match designs to needs or wants.

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.

- In addition to Proficient, the **Advanced** student is able to research and communicate with peers about possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem under a range of likely conditions.
- The **Proficient** student is able to generate and compare possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- The **Basic** student is able to identify possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- The **Below Basic** student may be able to identify a solution to a given 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.

- In addition to Proficient, the **Advanced** student is able to evaluate fair tests of a variety of solutions in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved and test improvements for effectiveness.
- The **Proficient** student is able to plan and carry out fair tests of a variety of solutions in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
- The **Basic** student is able to carry out a fair test in which variables are controlled.
- The **Below Basic** student may be able to identify variables in an investigation.

2020 Wyoming Science Performance Level Descriptors (PLDs)

Companion document to the [2016 Science Content Standards](#)

Grade 5 Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions

5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.

- In addition to Proficient, the **Advanced** student is able to research ways scientists detect particles of matter too small to be seen, evaluate those ways for effectiveness, and present findings.
- The **Proficient** student is able to develop a model to describe that matter is made of particles too small to be seen.
- The **Basic** student is able to use a model to describe matter as made of small particles that are too small to be seen.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to measure and graph quantities to represent the weight and/or volume of a substance when a new substance is made from two or more substances to verify that matter has been conserved.
- The **Proficient** student is able to 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.
- The **Basic** student is able to explain that matter is conserved when it changes form.
- The **Below Basic** student does not meet the Basic performance level.

5-PS1-3 Make observations and measurements to identify materials based on their properties.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation to identify materials based on their physical properties.
- The **Proficient** student is able to make observations and measurements to identify materials based on their properties.
- The **Basic** student is able to make observations to identify materials based on their physical properties.
- The **Below Basic** student does not meet the Basic performance level.

5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

- In addition to Proficient, the **Advanced** student is able to research and analyze uses of a new substance made from two or more substances.
- The **Proficient** student is able to conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- The **Basic** student is able to make observations that mixing different types of matter can result in new substances.
- The **Below Basic** student does not meet the Basic performance level.

2020 Wyoming Science Performance Level Descriptors (PLDs)

PS2 Motion and Stability: Forces and Interactions

5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.

- In addition to Proficient, the **Advanced** student is able to research and carry out an investigation to show that gravitational forces are constant for all objects and present an explanation of the phenomenon.
- The **Proficient** student is able to support an argument that the gravitational force exerted by Earth on objects is directed down.
- The **Basic** student is able to describe how Earth's objects are affected by gravitational forces.
- The **Below Basic** student does not meet the Basic performance level.

PS3 Energy

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.

- In addition to Proficient, the **Advanced** student is able to create models to compare how animals in different ecosystems get their energy and to provide evidence that the energy in their food was once energy from the sun.
- The **Proficient** student is able to use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain warmth) was once energy from the sun.
- The **Basic** student is able to identify that animals get their energy from food, which was once energy from the sun.
- The **Below Basic** student does not meet the Basic performance level.

PS4 Waves and their Applications in Technologies for Information Transfer – Not present in 5th grade

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

5-LS1-1 Support an argument that plants get the materials they need for growth primarily from air and water.

- In addition to Proficient, the **Advanced** student is able to interpret two or more pieces of data to construct or refine an argument that plants get the materials they need for growth primarily from air and water.
- The **Proficient** student is able to support an argument that plants get the materials they need for growth primarily from air and water.
- The **Basic** student is able to explain that plants get the materials they need for growth primarily from air and water.
- The **Below Basic** student does not meet the Basic performance level.

LS2 Ecosystems: Interactions, Energy, and Dynamics

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

- In addition to Proficient, the **Advanced** student is able to develop a model to describe the movement of matter among plants, animals, decomposers, and the environment when one or more components of the system are disrupted.
- The **Proficient** student is able to develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- The **Basic** student is able to label a model that shows the movement of matter among plants, animals, decomposers, and the environment.

2020 Wyoming Science Performance Level Descriptors (PLDs)

- The **Below Basic** student does not meet the Basic performance level.

LS3 Heredity: Inheritance and Variation of Traits – Not present in 5th grade

LS4 Biological Evolution: Unity and Diversity – Not present in 5th grade

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe

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.

- In addition to Proficient, the **Advanced** student is able to represent data in tables or graphical displays to compare stars of similar characteristics to the Sun to predict the apparent brightness.
- The **Proficient** student is able to support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
- The **Basic** student is able to identify that there are apparent differences in the brightness of the sun compared to other stars because the sun is the closest star.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to collect evidence over time and represent findings in graphical displays to reveal how the orbit and rotation of the Earth and Moon cause patterns of shadows, day and night, and the seasonal appearance of some stars in the night sky at different times of the day, month, and year.
- The **Proficient** student is able to 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.
- The **Basic** student is able to observe changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
- The **Below Basic** student does not meet the Basic performance level.

ESS2 Earth's Systems

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

- In addition to Proficient, the **Advanced** student is able to use a model to analyze how a change in the geosphere, biosphere, hydrosphere, and/or atmosphere could affect Earth's landforms, climates, surface materials, and processes.
- The **Proficient** student is able to develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- The **Basic** student is able to label a model showing the geosphere, biosphere, hydrosphere, and/or atmosphere.
- The **Below Basic** student does not meet the Basic performance level.

2020 Wyoming Science Performance Level Descriptors (PLDs)

5-ESS2-2 Describe and graph the amounts and percentages of water and freshwater in various reservoirs to provide evidence about the distribution of water on Earth.

- In addition to Proficient, the **Advanced** student is able to evaluate and present ways non-consumable (non-potable) water is collected and converted into consumable (potable) water.
- The **Proficient** student is able to describe and graph the amounts and percentages of water and freshwater in various reservoirs to provide evidence about the distribution of water on Earth.
- The **Basic** student is able to identify that water can be freshwater or saltwater, and that the vast majority of water on Earth is saltwater.
- The **Below Basic** student does not meet the Basic performance level.

ESS3 Earth and Human Activity

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to conserve Earth's resources and environment.

- In addition to Proficient, the **Advanced** student is able to research and evaluate ways individual communities use scientific ideas to conserve Earth's resources and environment.
- The **Proficient** student is able to obtain and combine information about ways individual communities use science ideas to conserve Earth's resources and environment.
- The **Basic** student is able to describe how human activities impact and conserve Earth's resources and environment.
- The **Below Basic** student does not meet the Basic performance level.

4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to develop alternative solutions to a simple design problem and evaluate the effectiveness of each solution.
- The **Proficient** student is able to define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- The **Basic** student is able to describe a simple design problem reflecting a need or a want.
- The **Below Basic** student may be able to match designs to needs or wants.

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.

- In addition to Proficient, the **Advanced** student is able to research and communicate with peers about possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem under a range of likely conditions.
- The **Proficient** student is able to generate and compare possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- The **Basic** student is able to identify possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- The **Below Basic** student may be able to identify a solution to a given problem.

2020 Wyoming Science Performance Level Descriptors (PLDs)

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.

- In addition to Proficient, the **Advanced** student is able to evaluate fair tests of a variety of solutions in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved and test improvements for effectiveness.
- The **Proficient** student is able to plan and carry out fair tests of a variety of solutions in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
- The **Basic** student is able to carry out a fair test in which variables are controlled.
- The **Below Basic** student may be able to identify variables in an investigation.

2020 Wyoming Science Performance Level Descriptors (PLDs)

Companion document to the [2016 Science Content Standards](#)
Grade 8 Science is assessed on WY-TOPP 2022+ - see [Science Blueprint](#)

Middle School Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions

MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe the atomic composition of simple molecules and extended structures.
- The **Proficient** student is able to develop models to describe the atomic composition of simple molecules and extended structures.
- The **Basic** student is able to use models to describe the individual components of atomic composition of simple molecules and extended structures.
- The **Below Basic** student may be able to label a model of the atomic composition of simple molecules.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate data to predict the outcome of chemical reaction(s).
- The **Proficient** student is able to analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- The **Basic** student is able to describe the properties of substances before and after the substances interact in order to determine if a chemical reaction has occurred.
- The **Below Basic** student may be able to determine whether a chemical reaction has occurred.

MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

- In addition to Proficient, the **Advanced** student is able to form an argument based on credible sources that synthetic materials have positive and negative impacts on society over time.
- The **Proficient** student is able to gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- The **Basic** student is able to describe that chemical processes convert natural resources to new materials, and match synthetic materials with their impact on society.
- The **Below Basic** student does not meet the Basic performance level.

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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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use a model that describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a variety of models to defend the law of conservation of mass.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use a model to describe that the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- The **Below Basic** student may be able to describe that the total number of atoms does not change in a chemical reaction.

MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

- In addition to Proficient, the **Advanced** student is able to evaluate and compare a variety of devices to determine how efficiently the devices either release or absorb thermal energy.
- The **Proficient** student is able to undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
- The **Basic** student is able to undertake a design project to construct and test a device that either releases or absorbs thermal energy by chemical processes.
- The **Below Basic** student does not meet the Basic performance level.

PS2 Motion and Stability: Forces and Interactions

MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

- In addition to Proficient, the **Advanced** student is able to apply Newton's Third Law to evaluate multiple design solutions to a problem involving the motion of two colliding objects.
- The **Proficient** student is able to apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- The **Basic** student is able to use Newton's Third Law to describe the motion of two colliding objects.
- The **Below Basic** student may be able to describe the key parts of Newton's Third Law.

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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.

- In addition to Proficient, the **Advanced** student is able to construct an argument using evidence to verify that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use data to describe that the change in an object's motion depends on the sum of the forces on the object or the mass of the object.
- The **Below Basic** student may be able to describe the relationship between mass and force.

MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

- In addition to Proficient, the **Advanced** student is able to use data to predict changes in the strength of electric and magnetic forces.
- The **Proficient** student is able to ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- The **Basic** student is able to describe the effect of the strength of electric and magnetic forces.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- The **Proficient** student is able to construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- The **Basic** student is able to use evidence to describe that gravitational interactions are attractive and depend on the masses of interacting objects.
- The **Below Basic** student may be able to describe the relationship between gravity and mass.

MS-PS2-5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

- In addition to Proficient, the **Advanced** student is able to revise an experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use evidence to describe that fields exist between objects exerting forces on each other even though the objects are not in contact.
- The **Below Basic** student does not meet the Basic performance level.

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PS3 Energy

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.

- In addition to Proficient, the **Advanced** student is able to evaluate graphical displays of data to predict the relationships of kinetic energy to the mass of an object and to the speed of an object.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use graphical displays of data to describe the relationships of kinetic energy to the mass of an object or to the speed of an object.
- The **Below Basic** student may be able to describe the relationships of kinetic energy to the mass of an object or to the speed of an object.

MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

- In addition to Proficient, the **Advanced** student is able to evaluate a variety of models to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use 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.
- The **Below Basic** student may be able to describe how energy is stored in a system.

MS-PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

- In addition to Proficient, the **Advanced** student is able to evaluate and compare a variety of devices to determine how efficiently thermal energy is transferred or conserved.
- The **Proficient** student is able to apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
- The **Basic** student is able to apply scientific principles to test a device that either minimizes or maximizes thermal energy transfer.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to construct an argument using evidence to verify that 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use data to describe 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.
- The **Below Basic** student may be able to describe the relationship between kinetic energy and temperature.

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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.

- In addition to Proficient, the **Advanced** student is able to evaluate arguments using evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use evidence to describe that when the kinetic energy of an object changes, energy is transferred to or from the object.
- The **Below Basic** student may be able to describe that when the kinetic energy of an object changes, energy is transferred to or from the object.

PS4 Waves and their Applications in Technologies for Information Transfer

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.

- In addition to Proficient, the **Advanced** student is able to use mathematical representations to evaluate a variety of wave models to demonstrate the relationship between the amplitude and the energy in a wave.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.
- The **Below Basic** student may be able to describe the relationship between amplitude and the energy of a wave.

MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

- In addition to Proficient, the **Advanced** student is able to evaluate multiple models to verify that waves are reflected, absorbed, or transmitted through various materials.
- The **Proficient** student is able to develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- The **Basic** student is able to use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to construct an argument using credible resources to justify the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe how digitized signals encode and transmit information.
- The **Below Basic** student does not meet the Basic performance level.

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2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise an experimental design to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- The **Proficient** student is able to conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- The **Basic** student is able to use evidence to describe that living things are made of cells; either one cell or many different numbers and types of cells.
- The **Below Basic** student may be able to identify that living things are made of cells.

MS-LS1-2 Develop and use models to describe the parts, functions, and basic processes of cells.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe the parts, functions, and basic processes of cells.
- The **Proficient** student is able to develop and use models to describe the parts, functions, and basic processes of cells.
- The **Basic** student is able to use models to describe the parts, functions, and basic processes of cells.
- The **Below Basic** student may be able to identify the basic parts of cells.

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

- In addition to Proficient, the **Advanced** student is able to evaluate arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- The **Proficient** student is able to use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- The **Basic** student is able to describe how the body is a system of interacting subsystems composed of groups of cells.
- The **Below Basic** student may be able to identify the body as a system of interacting subsystems.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise arguments 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use evidence to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- The **Below Basic** student may be able to identify characteristic animal behaviors or specialized plant structures that affect the probability of reproductive success.

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MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise scientific explanations based on evidence for how environmental and genetic factors influence the growth of organisms.
- The **Proficient** student is able to construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- The **Basic** student is able to use evidence to describe how environmental and genetic factors influence the growth of organisms.
- The **Below Basic** student may be able to identify environmental or genetic factors that influence the growth of organisms.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise scientific explanations based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use evidence to describe the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- The **Below Basic** student may be able to describe photosynthesis.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use 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.
- The **Below Basic** student may be able to identify that food molecules (sugar) support growth or release energy as this matter moves through an organism.

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.

- In addition to Proficient, the **Advanced** student is able to form an argument based on credible sources that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- The **Proficient** student is able to gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- The **Basic** student is able to use data to explain that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- The **Below Basic** student does not meet the Basic performance level.

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LS2 Ecosystems: Interactions, Energy, and Dynamics

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.

- In addition to Proficient, the **Advanced** student is able to evaluate data to predict the effects of resource availability on organisms and populations of organisms in an ecosystem.
- The **Proficient** student is able to analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- The **Basic** student is able to describe the effects of resource availability on organisms and populations of organisms in an ecosystem.
- The **Below Basic** student may be able to identify resources that affect populations of organisms in an ecosystem.

MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise explanations that predict patterns of interactions among organisms across multiple ecosystems.
- The **Proficient** student is able to construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- The **Basic** student is able to construct an explanation of interactions among organisms across multiple ecosystems.
- The **Below Basic** student does not meet the Basic performance level.

MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- The **Proficient** student is able to develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- The **Basic** student is able to use a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- The **Below Basic** student may be able to identify that matter cycles or energy flows among living and nonliving parts of an ecosystem.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise arguments supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- The **Proficient** student is able to construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- The **Basic** student is able to construct an argument that changes to physical or biological components of an ecosystem affect populations.
- The **Below Basic** student may be able to identify that changes to physical or biological components of an ecosystem affect populations.

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

- In addition to Proficient, the **Advanced** student is able to design and defend a solution for maintaining biodiversity and ecosystem services.
- The **Proficient** student is able to evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- The **Basic** student is able to evaluate a design solution for maintaining biodiversity and ecosystem services.
- The **Below Basic** student does not meet the Basic performance level.

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LS3 Heredity: Inheritance and Variation of Traits

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student may be able to identify that mutations can be harmful or beneficial to an organism.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- The **Below Basic** student may be able to identify that sexual reproduction results in genetic variation.

LS4 Biological Evolution: Unity and Diversity

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.

- In addition to Proficient, the **Advanced** student is able to construct an argument based on credible sources that patterns in the fossil record 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe 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.
- The **Below Basic** student may be able to identify that the fossil record plays a role in the history of life on Earth.

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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.

- In addition to Proficient, the **Advanced** student is able to evaluate, compare and/or revise explanations for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
- The **Proficient** student is able to 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.
- The **Basic** student is able to apply scientific ideas to describe the anatomical similarities and differences among modern organisms and between modern and fossil organisms.
- The **Below Basic** student does not meet the Basic performance level.

MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise explanations based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
- The **Proficient** student is able to construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
- The **Basic** student is able to use evidence to describe how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
- The **Below Basic** student does not meet the Basic performance level.

MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

- In addition to Proficient, the **Advanced** student is able to construct an argument based on credible sources demonstrating how technologies have changed the way humans influence the inheritance of desired traits in organisms.
- The **Proficient** student is able to gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- The **Basic** student is able to use information to describe that technologies have changed the way humans influence the inheritance of desired traits in organisms.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to use mathematical representations to evaluate explanations that support how natural selection may lead to increases and decreases of specific traits in populations over time.
- The **Proficient** student is able to use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- The **Basic** student is able to use a simple model to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- The **Below Basic** student may be able to identify that natural selection may lead to increases or decreases of specific traits in populations over time.

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3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student may be able to identify the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe the role of gravity in the motions within galaxies and the solar system.
- The **Proficient** student is able to develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- The **Basic** student is able to use a model to describe the role of gravity in the motions within galaxies and the solar system.
- The **Below Basic** student may be able to identify the role of gravity in the motions within galaxies or the solar system.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

- In addition to Proficient, the **Advanced** student is able to evaluate and defend models to analyze scale properties of objects in the solar system.
- The **Proficient** student is able to analyze and interpret data to determine scale properties of objects in the solar system.
- The **Basic** student is able to use data to determine scale properties of objects in the solar system.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise competing scientific explanations 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use evidence from rocks and rock strata to describe that the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
- The **Below Basic** student may be able to identify that the geologic time scale shows the Earth to be 4.6-billion-years-old.

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ESS2 Earth's Systems

MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe the cycling of Earth's materials and the flow of energy that drives this process.
- The **Proficient** student is able to develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- The **Basic** student is able to use a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- The **Below Basic** student may be able to identify that Earth's materials cycle.

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

- In addition to Proficient, the **Advanced** student is able to evaluate explanations based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- The **Proficient** student is able to construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- The **Basic** student is able to describe how geoscience processes have changed Earth's surface.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and defend models of the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- The **Proficient** student is able to analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- The **Basic** student is able to use data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- The **Below Basic** student may be able to identify that there is evidence of plate motion.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- The **Proficient** student is able to develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- The **Basic** student is able to use a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- The **Below Basic** student may be able to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

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MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

- In addition to Proficient, the **Advanced** student is able to evaluate models that predict how the motions and complex interactions of air masses results in changes in weather conditions.
- The **Proficient** student is able to collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
- The **Basic** student is able to use data to describe the motions and complex interactions of air masses result in changes in weather conditions.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise models to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- The **Below Basic** student does not meet the Basic performance level.

ESS3 Earth and Human Activity

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise scientific explanations 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to construct an explanation that the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- The **Below Basic** student may be able to identify that Earth's minerals, energy, or groundwater resources can vary by location.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and defend models which use natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- The **Proficient** student is able to analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- The **Basic** student is able to use data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- The **Below Basic** student may be able to identify that natural hazards can play a role in forecasting future catastrophic events.

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MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

- In addition to Proficient, the **Advanced** student is able to evaluate and compare designs for monitoring, evaluating, and managing a human impact on the environment.
- The **Proficient** student is able to apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
- The **Basic** student is able to apply scientific principles to test a device for monitoring, evaluating, and/or managing a human impact on the environment.
- The **Below Basic** student may be able to identify a positive or negative human impact on the environment.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate arguments supported by evidence for how changes in human populations and per-capita consumption of natural resources impact Earth's systems.
- The **Proficient** student is able to construct an argument supported by evidence for how changes in human populations and per-capita consumption of natural resources impact Earth's systems.
- The **Basic** student is able to describe that changes in human population and per-capita consumption of natural resources impact Earth's systems.
- The **Below Basic** student does not meet the Basic performance level.

MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused changes in global temperatures over time.

- In addition to Proficient, the **Advanced** student is able to construct an argument using evidence clarifying the factors that have caused changes in global temperatures over time.
- The **Proficient** student is able to ask questions to clarify evidence of the factors that have caused changes in global temperatures over time.
- The **Basic** student is able to identify factors that have caused changes in global temperatures over time.
- The **Below Basic** student does not meet the Basic performance level.

4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to evaluate the criteria and constraints of a design problem, with precision to ensure a successful solution, taking into account relevant scientific principles and clarify potential long-term impacts on people and the natural environment that may limit possible solutions.
- The **Proficient** student is able to define the criteria and constraints of a design problem, with precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and/or the natural environment that may limit possible solutions.
- The **Basic** student is able to define the criteria and constraints of a design problem that takes into account potential impacts on people or the natural environment.
- The **Below Basic** student may be able to identify criteria or constraints of a design problem.

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MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

- In addition to Proficient, the **Advanced** student is able to evaluate competing design solutions using a systematic process and construct an argument to determine how well a solution meets the criteria and constraints of a problem.
- The **Proficient** student is able to evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of a problem.
- The **Basic** student is able to develop and use a design solution using a systematic process to determine how well it meets the criteria and constraints of a problem.
- The **Below Basic** student may be able to use a design solution to determine how well it meets the criteria or constraints of a problem.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate data from tests to determine the best characteristics of each solution and to propose a new solution which better meets the criteria for success.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use data to determine similarities and differences among several design solutions to identify the best characteristics of each.
- The **Below Basic** student may be able to identify similarities or differences among several design solutions.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use an iterative process to test a model, collect data, and generate modification ideas for the design.
- The **Below Basic** student may be able to test a model of a design and collect data.

ETS2 Engineering, Technology, and Applications of Science

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.

- In addition to Proficient, the **Advanced** student is able to collect and use data to reverse-engineer a common household appliance to learn how its design has evolved and explore how science, engineering and technology might be used together or individually in producing improved versions of the appliance.
- The **Proficient** student is able to ask questions about a common household appliance, collect data to learn how its 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.

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- The **Basic** student is able to ask questions about a common household appliance to describe how scientific discoveries, technological advances, and engineering design played significant roles in its development.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise competing models 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use a model to identify the consequences of human activity on a particular aspect of the environment.
- The **Below Basic** student may be able to identify the consequences of human activity on the environment.

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Companion document to the [2016 Science Content Standards](#)
Grade 10 Science is assessed on WY-TOPP 2022+ - see [Science Blueprint](#)

High School Science Content Standards & PLDs

1. PHYSICAL SCIENCE

PS1 Matter and Its Interactions

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.

- In addition to Proficient, the **Advanced** student is able to use the periodic table as a model to compare and contrast the relative properties of multiple elements based on the patterns of electrons in the outermost energy level of atoms.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
- The **Below Basic** student may be able to identify the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

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.

- In addition to Proficient, the **Advanced** student is able to construct and revise 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.
- The **Proficient** student is able to construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms and knowledge of the patterns of chemical properties.
- The **Basic** student is able to construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise an investigation to gather evidence to compare the structure of substances at the macroscopic scale to infer the strength of electrical forces between particles.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student does not meet the Basic performance level.

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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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a given model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to use evidence to make a claim and provide reasoning about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student may be able to identify evidence about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and refine the design of a chemical system by changing conditions to produce increased amounts of products at equilibrium.
- The **Proficient** student is able to evaluate the design of a chemical system by changing conditions to produce increased amounts of products at equilibrium.
- The **Basic** student is able to use a model of a chemical system by changing conditions to produce increased amounts of products at equilibrium.
- The **Below Basic** student does not meet the Basic performance level.

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

- In addition to Proficient, the **Advanced** student is able to construct mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- The **Proficient** student is able to use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- The **Basic** student is able to identify and describe mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- The **Below Basic** student may be able to identify that atoms, and therefore mass, are conserved during a chemical reaction.

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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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use 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.
- The **Below Basic** student may be able to use models to identify the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

PS2 Motion and Stability: Forces and Interactions

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.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation to collect 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe 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.
- The **Below Basic** student may be able to identify that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

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.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an experiment to gather data to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe 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.
- The **Below Basic** student may be able to identify that the total momentum of a system of objects is conserved when there is no net force on the system.

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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.

- In addition to Proficient, the **Advanced** student is able to compare and contrast two different devices that minimizes the force on a macroscopic object during a collision.
- The **Proficient** student is able to apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
- The **Basic** student is able to apply scientific and engineering ideas to design and evaluate a device that minimizes the force on a macroscopic object during a collision.
- The **Below Basic** student may be able to apply scientific and engineering ideas to evaluate a device that minimizes the force on a macroscopic 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.

- In addition to Proficient, the **Advanced** student is able to create a mathematical representation predicting the gravitational and/or electrostatic forces between objects using Newton's Law of Gravitation and/or Coulomb's Law, respectively.
- The **Proficient** student is able to 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.
- The **Basic** student is able to use mathematical representations to identify and describe the gravitational forces between objects using Newton's Law of Gravitation.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student does not meet the Basic performance level.

HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials.

- In addition to Proficient, the **Advanced** student is able to evaluate scientific and technical information to make a claim about why the molecular-level structure is important in the functioning of materials.
- The **Proficient** student is able to communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials.
- The **Basic** student is able to identify scientific and technical information about how the molecular-level structure is important in the functioning of materials.
- The **Below Basic** student does not meet the Basic performance level.

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PS3 Energy

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe a 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.
- The **Below Basic** student may be able to identify a 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.

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).

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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).
- The **Proficient** student is able to 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).
- The **Basic** student is able to use models to describe how 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).
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to compare and contrast the efficiency of multiple devices that have been designed, built and refined to evaluate the best solution based on cost, safety, reliability, and aesthetics as well as possible social, cultural, and/or environmental impacts.
- The **Proficient** student is able to design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
- The **Basic** student is able to build a device that works within given constraints to convert one form of energy into another form of energy.
- The **Below Basic** student may be able to identify how one form of energy converts into another form of energy.

HS-PS3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system.
- The **Proficient** student is able to plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system.

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- The **Basic** student is able to conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student does not meet the Basic performance level.

PS4 Waves and their Applications in Technologies for Information Transfer

HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

- In addition to Proficient, the **Advanced** student is able to evaluate mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
- The **Proficient** student is able to use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
- The **Basic** student is able to use mathematical evidence to describe relationships among the frequency, wavelength, and speed of waves traveling in various media.
- The **Below Basic** student may be able to describe relationships between wavelength and speed of waves traveling in various media.

HS-PS4-2 Evaluate the advantages and disadvantages of using digital transmission and storage of information.

- In addition to Proficient, the **Advanced** student is able to plan and conduct an investigation demonstrating the advantages and disadvantages of using digital transmission and storage of information.
- The **Proficient** student is able to evaluate the advantages and disadvantages of using digital transmission and storage of information.
- The **Basic** student is able to identify and describe the advantages and disadvantages of using digital transmission and storage of information.
- The **Below Basic** student does not meet the Basic performance level.

HS-PS4-3 Evaluate 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.

- In addition to Proficient, the **Advanced** student is able to, based on evidence, make a claim and provide reasoning that electromagnetic radiation can be described by a wave model and a particle model, and that for some situations one model is more useful than the other.
- The **Proficient** student is able to evaluate 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.

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- The **Basic** student is able to identify evidence behind the idea that electromagnetic radiation can be described either by a wave model or a particle model.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to create a technological device that uses principles of wave behavior and wave interactions with matter and evaluate how the device transmits and captures information and energy.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
- The **Below Basic** student does not meet the Basic performance level.

2. LIFE SCIENCE

LS1 From Molecules to Organisms: Structure and Processes

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.

- In addition to Proficient, the **Advanced** student is able to analyze relevant evidence to revise an explanation for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe 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.
- The **Below Basic** student may be able to identify 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.

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.
- The **Proficient** student is able to develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.
- The **Basic** student is able to identify and describe a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.
- The **Below Basic** student may be able to identify a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.

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HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

- In addition to Proficient, the **Advanced** student is able to revise an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- The **Proficient** student is able to plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- The **Basic** student is able to conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- The **Below Basic** student may be able to identify evidence that feedback mechanisms maintain homeostasis.

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

- In addition to Proficient, the **Advanced** student is able to develop a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- The **Proficient** student is able to use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- The **Basic** student is able to identify and describe the role of cellular division (mitosis) in producing and maintaining organisms.
- The **Below Basic** student may be able to identify the role of cellular division (mitosis) in producing and maintaining organisms.

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

- In addition to Proficient, the **Advanced** student is able to develop a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- The **Proficient** student is able to use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- The **Basic** student is able to identify and describe how photosynthesis transforms light energy into stored chemical energy.
- The **Below Basic** student may be able to identify how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6 Construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.

- In addition to Proficient, the **Advanced** student is able to compare and contrast models to support explanations for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.
- The **Proficient** student is able to construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.
- The **Basic** student is able to, based on evidence, identify and describe: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.
- The **Below Basic** student may be able to, based on evidence, identify: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.

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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.

- In addition to Proficient, the **Advanced** student is able to develop 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe 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.
- The **Below Basic** student may be able to identify that cellular respiration is a chemical process resulting in a net transfer of energy.

LS2 Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- The **Proficient** student is able to use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- The **Basic** student is able to use a model to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to use mathematical representations to predict explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- The **Proficient** student is able to use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- The **Basic** student is able to use mathematical representations to identify explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- The **Below Basic** student may be able to identify explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

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.

- In addition to Proficient, the **Advanced** student is able to, given evidence, develop a claim and provide reasoning for the cycling of matter and compare the flow of energy in aerobic and anaerobic conditions.
- The **Proficient** student is able to construct an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions, and revise as needed.
- The **Basic** student is able to identify and describe evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

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- The **Below Basic** student may be able to identify evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

- In addition to Proficient, the **Advanced** student is able to, using mathematical representations, develop a claim and provide reasoning for the cycling of matter and flow of energy among organisms in an ecosystem.
- The **Proficient** student is able to use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- The **Basic** student is able to use mathematical representations to describe the cycling of matter and flow of energy among organisms in an ecosystem.
- The **Below Basic** student may be able to use mathematical representations to identify the cycling of matter and flow of energy among organisms in an ecosystem.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
- The **Proficient** student is able to develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
- The **Basic** student is able to use a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
- The **Below Basic** student may be able to identify the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

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.

- In addition to Proficient, the **Advanced** student is able to, given a set of evidence, develop a claim and provide 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe how 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.
- The **Below Basic** student may be able to identify how biotic or abiotic interactions in ecosystems maintain stable conditions, but changing those conditions may result in a modified ecosystem.

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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.

- In addition to Proficient, the **Advanced** student is able to design, evaluate and refine a solution for mitigating impacts on the environment and biodiversity.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe impacts on the environment and biodiversity in order to refine or design a solution for detrimental impacts or enhancement for positive impacts.
- The **Below Basic** student does not meet the Basic performance level.

HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

- In addition to Proficient, the **Advanced** student is able to analyze multiple lines of evidence to make a claim and provide reasoning for the role of group behavior on individual and species' chances to survive and reproduce.
- The **Proficient** student is able to evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- The **Basic** student is able to identify or describe evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- The **Below Basic** student does not meet the Basic performance level.

LS3 Heredity: Inheritance and Variation of Traits

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.

- In addition to Proficient, the **Advanced** student is able to use evidence to develop a claim and provide reasoning for the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- The **Proficient** student is able to ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- The **Basic** student is able to identify and describe relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- The **Below Basic** student may be able to identify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents 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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to 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.
- The **Below Basic** student may be able to identify 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.

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HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

- In addition to Proficient, the **Advanced** student is able to, given statistical data and probability, predict variation and distribution of expressed traits in a population.
- The **Proficient** student is able to apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- The **Basic** student is able to explain how expressed traits vary and are distributed in a population.
- The **Below Basic** student may be able to explain how traits vary in a population.

LS4 Biological Evolution: Unity and Diversity

HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

- In addition to Proficient, the **Advanced** student is able to communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- The **Proficient** student is able to communicate scientific information that common ancestry and biological evolution are supported by empirical evidence.
- The **Basic** student is able to identify and describe scientific information that common ancestry and biological evolution are supported by empirical evidence.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to, based on given evidence, develop a claim and provide reasoning 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe an explanation about the process of evolution.
- The **Below Basic** student may be able to identify a factor involved in the process of evolution.

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.

- In addition to Proficient, the **Advanced** student is able to, given statistical data and probability, predict advantageous heritable traits and evaluate which organisms with those traits will increase in proportion to organisms lacking the traits.
- The **Proficient** student is able to 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.
- The **Basic** student is able to describe and identify how organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- The **Below Basic** student does not meet the Basic performance level.

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HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

- In addition to Proficient, the **Advanced** student is able to, given evidence, develop a claim and provide reasoning for how natural selection leads to adaptation of populations.
- The **Proficient** student is able to construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- The **Basic** student is able to identify and describe how natural selection leads to adaptation of populations.
- The **Below Basic** student may be able to identify how natural selection leads to adaptation of populations.

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.

- In addition to Proficient, the **Advanced** student is able to, given evidence, develop a claim and provide reasoning 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe changes in environmental conditions that 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.
- The **Below Basic** student does not meet the Basic performance level.

HS-LS4-6 Create and/or use a simulation to evaluate the impacts of human activity on biodiversity.

- In addition to Proficient, the **Advanced** student is able to create a simulation to evaluate the impacts of human activity on biodiversity.
- The **Proficient** student is able to use a simulation to evaluate the impacts of human activity on biodiversity.
- The **Basic** student is able to identify and describe the impacts of human activity on biodiversity.
- The **Below Basic** student does not meet the Basic performance level.

3. EARTH AND SPACE SCIENCE

ESS1 Earth's Place in the Universe

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.

- In addition to Proficient, the **Advanced** student is able to extend or analyze a model to include different types of stars and their life cycles.
- The **Proficient** student is able to 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.
- The **Basic** student is able to, given a model, identify processes that govern the lifespan of the Sun and the energy it emits.
- The **Below Basic** student does not meet the Basic performance level.

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HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

- In addition to Proficient, the **Advanced** student is able to use mathematical or computational thinking to 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.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify lines of evidence that support the Big Bang theory, including astronomical evidence of light spectra, motion of distant galaxies, and/or composition of matter in the universe.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements.

- In addition to Proficient, the **Advanced** student is able to compare and contrast models that depict how elements are produced in different star life cycles.
- The **Proficient** student is able to create a model to communicate scientific ideas about the way stars, over their life cycle, produce elements.
- The **Basic** student is able to, given a model of a star's life cycle, sequence the elements that are produced based on mass. (Example elements: Hydrogen, Helium, and Iron)
- The **Below Basic** student may be able to, given a model, identify that stars produce elements during their life span.

HS-ESS1-4 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

- In addition to Proficient, the **Advanced** student is able to use mathematical and computational representations to predict the motion of orbiting objects in the solar system.
- The **Proficient** student is able to use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
- The **Basic** student is able to use mathematical or computational representations to describe the motion of orbiting objects in the solar system.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate evidence of the past and current movements, and predict future movements, of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify 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.
- The **Below Basic** student, given a model, can identify evidence of the past and current movements of continental and oceanic crust.

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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.

- In addition to Proficient, the **Advanced** student is able to evaluate scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- The **Below Basic** student does not meet the Basic performance level.

ESS2 Earth's Systems

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise 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.
- The **Proficient** student is able to 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.
- The **Basic** student, given a model, can describe how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- The **Below Basic** student does not meet the Basic performance level.

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.

- In addition to Proficient, the **Advanced** student is able to analyze geoscience data and create a model to support the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
- The **Proficient** student is able to analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
- The **Basic** student is able to identify geoscience data to support the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

- In addition to Proficient, the **Advanced** student is able to analyze/revise a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- The **Proficient** student is able to develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- The **Basic** student is able to use a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- The **Below Basic** student does not meet the Basic performance level.

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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.

- In addition to Proficient, the **Advanced** student is able to develop a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- The **Proficient** student is able to use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- The **Basic** student is able to identify and describe variations in the flow of energy into and out of Earth's systems result in changes in climate.
- The **Below Basic** student may be able to identify variations in the flow of energy into and out of Earth's systems result in changes in climate.

HS-ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise an investigation of the properties of water and its effects on Earth materials and surface processes.
- The **Proficient** student is able to plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
- The **Basic** student is able to describe the properties of water and its effects on Earth materials and surface processes.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

- In addition to Proficient, the **Advanced** student is able to develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- The **Proficient** student is able to develop a model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- The **Basic** student is able to use a model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

- In addition to Proficient, the **Advanced** student is able to predict the simultaneous coevolution of Earth's systems and life on Earth based on current evidence.
- The **Proficient** student is able to construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
- The **Basic** student is able to identify and describe the evidence about the simultaneous coevolution of Earth's systems and life on Earth.
- The **Below Basic** student may be able to identify evidence about the simultaneous coevolution of Earth's systems and life on Earth.

ESS3 Earth and Human Activity

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.

- In addition to Proficient, the **Advanced** student is able to predict how future human activity will influence the availability of natural resources, natural hazards and climate change.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify and describe an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

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- The **Below Basic** student may be able to identify evidence to explain how the availability of natural resources, occurrence of natural hazards, and 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.

- In addition to Proficient, the **Advanced** student is able to construct and revise solutions for developing, managing, and using energy and mineral resources based on cost-benefit ratios.
- The **Proficient** student is able to evaluate competing design solutions for developing, managing, and using energy and mineral resources based on cost-benefit ratios.
- The **Basic** student is able to identify and describe competing design solutions for developing, managing, and using energy and mineral resources based on cost-benefit ratios.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS3-3 Use computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

- In addition to Proficient, the **Advanced** student is able to use computational tools to determine quantitative relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- The **Proficient** student is able to use computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- The **Basic** student is able to identify and describe relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

- In addition to Proficient, the **Advanced** student is able to evaluate and refine a technological solution that reduces impacts of human activities on natural systems.
- The **Proficient** student is able to evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- The **Basic** student is able to describe a technological solution that reduces impacts of human activities on natural systems.
- The **Below Basic** student does not meet the Basic performance level.

HS-ESS3-5 Analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

- In addition to Proficient, the **Advanced** student is able to synthesize information from additional sources that could be added to an evidence-based model forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
- The **Proficient** student is able to analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
- The **Basic** student is able to describe how climate models forecast the current rate of global or regional climate change and associated future impacts to Earth systems.
- The **Below Basic** student may be able to identify how the current rate of global or regional climate change impacts Earth systems in the future.

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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.

- In addition to Proficient, the **Advanced** student is able to use the results of a computational representation to analyze and predict the relationships among Earth systems and how those relationships are being modified due to human activity.
- The **Proficient** student is able to 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.
- The **Basic** student is able to identify relationships among Earth systems and how those relationships are being modified due to human activity.
- The **Below Basic** student does not meet the Basic performance level.

4. ENGINEERING AND DESIGN

ETS1 Engineering, Technology, and Applications of Science

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a solution for a major global challenge using qualitative and quantitative criteria and constraints that account for societal needs and wants.
- The **Proficient** student is able to analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- The **Basic** student is able to identify a major global challenge for solutions that account for societal needs and wants.
- The **Below Basic** student may be able to identify a major global challenge for solutions that account for societal needs and wants.

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.

- In addition to Proficient, the **Advanced** student is able to evaluate and revise a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- The **Proficient** student is able to design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- The **Basic** student is able to identify and describe a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- The **Below Basic** student may be able to identify a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

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HS-ETS1-3 Evaluate a solution to a complex 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.

- In addition to Proficient, the **Advanced** student is able to design and revise a solution to a complex 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.
- The **Proficient** student is able to evaluate a solution to a complex 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.
- The **Basic** student is able to identify a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, or aesthetics as well as possible social, cultural, or environmental impacts.
- The **Below Basic** student does not meet the Basic performance level.

HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

- In addition to Proficient, the **Advanced** student is able to revise a computer simulation to model the impact of proposed solutions to complex real-world problems through identification of additional criteria and constraints on interactions within and between systems relevant to the problem.
- The **Proficient** student is able to use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
- The **Basic** student is able to use a model to demonstrate the impact of a proposed solution to a real-world problem with given criteria and constraints on interactions within and between systems relevant to the problem.
- The **Below Basic** student may be able to use a model to identify the impact of a proposed solution to a real-world problem with given constraints on interactions within and between systems relevant to the problem.

HS-ETS1-5 Evaluate the validity and reliability of claims in a variety of materials.

- In addition to Proficient, the **Advanced** student is able to, when given a claim from a scientific and technical text or media report, provide evidence and reasoning to support or refute the validity and reliability of that claim.
- The **Proficient** student is able to evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports.
- The **Basic** student is able to identify and describe the validity and reliability of a claim in a material.
- The **Below Basic** student does not meet the Basic performance level.