Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.

5-PS1-1 Matter and Its Interactions

Students who demonstrate understanding can:

5-PS1-1. **Develop a model to describe that matter is made of particles too small to be seen.** [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Use models to describe phenomena.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Crosscutting Concepts

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large.

Observable features of the student performance by the end of the grade:

1	Components of the model	
	a	Students develop a model to describe* a phenomenon that includes the idea that matter is made of particles too small to be seen. In the model, students identify the relevant components for the phenomenon, including:
		i. Bulk matter (macroscopic observable matter; e.g., as sugar, air, water).
		ii. Particles of matter that are too small to be seen.
2	Relationships	
	a	In the model, students identify and describe* relevant relationships between components, including the relationships between:
		i. Bulk matter and tiny particles that cannot be seen (e.g., tiny particles of matter that cannot be seen make up bulk matter).
		ii. The behavior of a collection of many tiny particles of matter and observable phenomena involving bulk matter (e.g., an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind).
3	Connections	
	a	Students use the model to describe* how matter composed of tiny particles too small to be seen can account for observable phenomena (e.g., air inflating a basketball, ice melting into water).

5-PS1-2 Matter and Its Interactions

Students who demonstrate understanding can:

5-PS1-2. **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.** [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [*Assessment Boundary: Assessment does not include distinguishing mass and weight.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.

PS1.B: Chemical Reactions

- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)

Crosscutting Concepts

Scale, Proportion, and Quantity

- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

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Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems.

Observable features of the student performance by the end of the grade:		
1	Representation	
	a	Students measure and graph the given quantities using standard units, including:
		i. The weight of substances before they are heated, cooled, or mixed.
		ii. The weight of substances, including any new substances produced by a reaction, after they are heated, cooled, or mixed.
2	Mathematical/computational analysis	
	a	Students measure and/or calculate the difference between the total weight of the substances (using standard units) before and after they are heated, cooled, and/or mixed.
	b	Students describe* the changes in properties they observe during and/or after heating, cooling, or mixing substances.
	c	Students use their measurements and calculations to describe* that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed.
	d	Students use measurements and descriptions* of weight, as well as the assumption of consistent patterns in natural systems, to describe* evidence to address scientific questions about the conservation of the amount of matter, including the idea that the total weight of matter is conserved after heating, cooling, or mixing substances.

5-PS1-3 Matter and Its Interactions

Students who demonstrate understanding can:

5-PS1-3. **Make observations and measurements to identify materials based on their properties.** [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [*Assessment Boundary: Assessment does not include density or distinguishing mass and weight.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)

Crosscutting Concepts

Scale, Proportion, and Quantity

- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a	From the given investigation plan, students identify the phenomenon under investigation, which includes the observable and measurable properties of materials.
	b	Students identify the purpose of the investigation, which includes collecting data to serve as the basis for evidence for an explanation about the idea that materials can be identified based on their observable and measurable properties.
2	Identifying the evidence to address the purpose of the investigation	
	a	From the given investigation plan, students describe* the evidence from data (e.g., qualitative observations and measurements) that will be collected, including:
		i. Properties of materials that can be used to identify those materials (e.g., color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility).
	b	Students describe* how the observations and measurements will provide the data necessary to address the purpose of the investigation.
3	Planning the investigation	
	a	From the given plan investigation plan, students describe* how the data will be collected. Examples could include:
		i. Quantitative measures of properties, in standard units (e.g., grams, liters).
		ii. Observations of properties such as color, conductivity, and reflectivity.
		iii. Determination of conductors vs. nonconductors and magnetic vs. nonmagnetic materials.
	b	Students describe* how the observations and measurements they make will allow them to identify materials based on their properties.
4	Collecting the data	
	a	Students collect and record data, according to the given investigation plan.

5-PS1-4 Matter and Its Interactions

Students who demonstrate understanding can:

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

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Disciplinary Core Ideas

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed.

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a	From the given investigation plan, students describe* the phenomenon under investigation, which includes the mixing of two or more substances.
	b	Students identify the purpose of the investigation, which includes providing evidence for whether new substances are formed by mixing two or more substances, based on the properties of the resulting substance.
2	Identifying the evidence to address the purpose of the investigation	
	a	From the given investigation plan, students describe* the evidence from data that will be collected, including:
		i. Quantitative (e.g., weight) and qualitative properties (e.g., state of matter, color, texture, odor) of the substances to be mixed.
		ii. Quantitative and qualitative properties of the resulting substances.
	b	Students describe* how the collected data can serve as evidence for whether the mixing of the two or more tested substances results in one or more new substances.
3	Planning the investigation	
	a	From the given investigation plan, students describe* how the data will be collected, including:
		i. How quantitative and qualitative properties of the two or more substances to be mixed will be determined and measured.
		ii. How quantitative and qualitative properties of the substances that resulted from the mixture of the two or more substances will be determined and measured.
		iii. Number of trials for the investigation.
		iv. How variables will be controlled to ensure a fair test (e.g., the temperature at which the substances are mixed, the number of substances mixed together in each trial).
4	Collecting the data	
	a	According to the investigation plan, students collaboratively collect and record data, including data about the substances before and after mixing.

5-PS2-1 Motion and Stability: Forces and Interaction

Students who demonstrate understanding can:

5-PS2-1. **Support an argument that the gravitational force exerted by Earth on objects is directed down.** [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [*Assessment Boundary: Assessment does not include mathematical representation of gravitational force.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Support an argument with evidence, data, or a model.	**PS2.B: Types of Interactions** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change.

Observable features of the student performance by the end of the grade:		
1	Supported claims	
	a	Students identify a given claim to be supported about a phenomenon. The claim includes the idea that the gravitational force exerted by Earth on objects is directed down toward the center of Earth.
2	Identifying scientific evidence	
	a	Students identify and describe* the given evidence, data, and/or models that support the claim, including:
		i. Multiple lines of evidence that indicate that the Earth's shape is spherical (e.g., observation of ships sailing beyond the horizon, the shape of the Earth's shadow on the moon during an eclipse, the changing height of the North Star above the horizon as people travel north and south).
		ii. That objects dropped appear to fall straight down.
		iii. That people live all around the spherical Earth, and they all observe that objects appear to fall straight down.
3	Evaluation and critique	
	a	Students evaluate the evidence to determine whether it is sufficient and relevant to supporting the claim.
	b	Students describe* whether any additional evidence is needed to support the claim.
4	Reasoning and synthesis	
	a	Students use reasoning to connect the relevant and appropriate evidence to support the claim with argumentation. Students describe* a chain of reasoning that includes:
		i. If Earth is spherical, and all observers see objects near them falling directly "down" to the Earth's surface, then all observers would agree that objects fall toward the Earth's center.
		ii. Since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.

5-PS3-1 Energy

Students who demonstrate understanding can:

5-PS3-1. **Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Use models to describe phenomena.

Disciplinary Core Ideas

PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).

LS1.C: Organization for Matter and Energy Flow in Organisms

- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. *(secondary)*

Crosscutting Concepts

Energy and Matter

- Energy can be transferred in various ways and between objects.

Observable features of the student performance by the end of the grade:			
1	Components of the model		
	a	Students use models to describe* a phenomenon that includes the idea that energy in animals' food was once energy from the sun. Students identify and describe* the components of the model that are relevant for describing* the phenomenon, including:	
		i.	Energy.
		ii.	The sun.
		iii.	Animals, including their bodily functions (e.g., body repair, growth, motion, body warmth maintenance).
		iv.	Plants.
2	Relationships		
	a	Students identify and describe* the relevant relationships between components, including:	
		i.	The relationship between plants and the energy they get from sunlight to produce food.
		ii.	The relationship between food and the energy and materials that animals require for bodily functions (e.g., body repair, growth, motion, body warmth maintenance).
		iii.	The relationship between animals and the food they eat, which is either other animals or plants (or both), to obtain energy for bodily functions and materials for growth and repair.
3	Connections		
	a	Students use the models to describe* causal accounts of the relationships between energy from the sun and animals' needs for energy, including that:	
		i.	Since all food can eventually be traced back to plants, all of the energy that animals use for body repair, growth, motion, and body warmth maintenance is energy that once came from the sun.
		ii.	Energy from the sun is transferred to animals through a chain of events that begins with plants producing food then being eaten by animals.