

Coherence and Alignment Among Science Curriculum, Instruction, and Assessment (CASCIA)

Grade 5 Unit 1 End-of-Unit Assessment

Task Interpretation Guide

August 2023



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Introduction

Research on the influence of assessment practices on student learning is clear. The use of formative assessment practices, with informative and immediate feedback that leads to adjustments to instructional next steps, has been shown to be effective in helping students learn (Black & Wiliam, 1998; Wylie & Lyon, 2009; Heritage, 2010). Interim or large-scale summative assessments, such as those required under the *Every Student Succeeds Act of 2015 (ESSA)*, cannot and are not meant to inform daily instruction because of how and when they are administered. These forms of assessment can bring value to an assessment system, but only if coordinated and meaningfully aligned within a comprehensive, coherent system.

The Coherence and Alignment Among Science Curriculum, Instruction, and Assessment (CASCIA) Project brings together three partner states—Nebraska, Alabama, and Alaska—with a team of researchers and experts to establish science assessment resources that are coordinated and aligned across all parts of the assessment system. With coherence as the guiding principle, these state-level educators and national science education and measurement experts have joined with hundreds of local educators to address states’ need for quality, standards-aligned science assessments that generate meaningful, interpretable, and actionable results, and to design a scoring and score reporting framework that builds educators’ capacity to track, interpret, and communicate students’ learning in science and to offer effective instruction for all students.

Purpose

The purpose of the *Grade 5 Unit 1 End-of-Unit Assessment Task Interpretation Guide* is to support educators’ understanding of the Grade 5 Unit 1 End-of-Unit assessment tasks and prompts, their features, and the evidence (i.e., knowledge and skills) they are designed to elicit about student learning, and how the assessment and the information it provides can be used to plan instruction and learning opportunities for students, whether it involves planning for instruction prior to teaching the instructional unit, reflecting on the quality and sufficiency of prior

instruction and instructional materials or planning additional student learning opportunities or interventions in the subsequent unit (e.g., SIPS Unit 2).

The Grade 5 Unit 1 Science Assessment includes three science tasks, each including multiple scorable prompts. Task 1, *What’s the Matter?*, includes three prompts and 11 possible score points with one prompt having three parts—Part A, Part B, and Part C; Task 2, *What Just Happened?*, includes three prompts and 10 possible score points with two of the three prompts having two parts—Part A and Part B; Task 3, *Change or Not?*, includes two prompts and seven possible score points with two of the three prompts having two parts—Part A and Part B.

Prompts from the three tasks that measure similar combinations of dimensions (i.e., Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts) from the Next Generation Science Standards (NGSS) are organized into three performance categories. The NGSS Performance Expectations (PEs) are addressed in one or more performance categories to provide multiple opportunities to demonstrate flexible thinking and competency in different situations and contexts.

Performance Category	NGSS PEs	Prompts in Performance Category	Points Possible
Model the Structure of Matter	5-PS1-1	Task 1, Prompt 1 Task 2, Prompt 1	10 points
Use Observations and Measurements of Properties of Matter	5-PS1-3	Task 1, Prompt 2 Task 1, Prompt 3 Task 2, Prompt 2 Task 2, Prompt 3	11 points
Use Observations and Measurements of Chemical Reactions	5-PS1-2 5-PS1-4	Task 3, Prompt 1 Task 3, Prompt 2	7 points

Contents

This document includes interpretive guidance to support educators' understanding of each prompt on the Grade 5 Unit 1 EOU Assessment, its features, and the evidence it is designed to elicit about students' learning, and offers important connections to the learning goals, formative assessment opportunities, and lesson descriptions within the SIPS Grade 5 Unit 1 Map / Instructional Framework as well as connections to future learning opportunities in the next unit.

For each prompt, the following information is provided:

- **Performance Category** – The performance category to which the prompt is aligned.
- **Acquisition Goals** – The acquisition goals from Stage 1 of the unit map / instructional framework that the prompt is intended to measure.
- **Prompt Knowledge and Skills for Measurement** – The evidence of student learning the prompt is designed to elicit.
- **Prompt and Exemplar Response** – The prompt with an example exemplar response. An exemplar response represents a high-quality response that provides evidence that students have demonstrated the knowledge, skills, and abilities assessed by the prompt. Student exemplars are intended to assist in understanding the nature and expectations of the prompt. However, students may respond with other relevant scientifically accurate responses, evidence, observations, and ideas.

In general, a full-point exemplar response meets expectations and is:

- scientifically accurate
- complete
- coherent
- consistent with the type of student evidence expected as described in the rubric

For examples of student responses for each prompt representative of the full range of score points possible based on the scoring rubric, access the [Grade 5 Unit 1 EOU Assessment Scoring Guide](#).

- **Prompt Complexity** – The complexity features of the prompt based on the SIPS Complexity Framework. The sophistication of students' ability to demonstrate sense-making is characterized by their ability to (a) use disciplinary core ideas (DCIs), scientific and engineering practices (SEPs), and crosscutting concepts (CCCs) together in the service of sense-making about a phenomenon or problem, and (b) engage with and respond to items and tasks designed using variable features representing combinations of Low, Moderate, and High complexity designations. These combinations of features are based on the [SIPS Complexity Framework](#).

Adapted from the Cambridge Alignment Methodology (Forte, 2021) and informed by aspects of Achieve's Framework to Evaluate Cognitive Complexity in Science Assessments (Achieve, 2019), the SIPS Complexity Framework is grounded in sense-making and students' ability to flexibly apply knowledge through the integration of the same and new/different combinations of dimensions within the PEs from a unit bundle, in the context of a phenomenon or phenomenon-rooted design problem based on the focal DCIs.

- **Prompt Connections to the Unit Map / Instructional Framework** – A high-level overview of the evidence elicited by the prompt related to the acquisition goals, connections to the instructionally-embedded formative assessment opportunities within stage 2 of the unit map, and connections to opportunities to learn based on the lesson descriptions within stage 3 of the unit map.

For each of the three tasks, the following information is provided:

- **Connections to Future Learning Opportunities** – The knowledge, skills, and abilities elicited by the prompt that can be leveraged and extended in future learning. Unit connections highlight where and how an educator can emphasize connections for students in the next unit.

SIPS Grade 5 Unit 1 EOU Assessment Task 1: What's the Matter

Prompt 1 – Parts A and B

Performance Category: Model the Structure of Matter

Acquisition Goals

- **A4.** Develop or use a model that shows that a substance, regardless of the quantity, is made up of particles too small to be seen.
- **A5.** Construct an explanation to support the claim that substances are made up of particles too small to be seen.

Prompt 1 Parts A and B measure students' ability to:

- Develop or use models to support descriptions of how matter is made of particles too small to be seen.

Student Worksheet

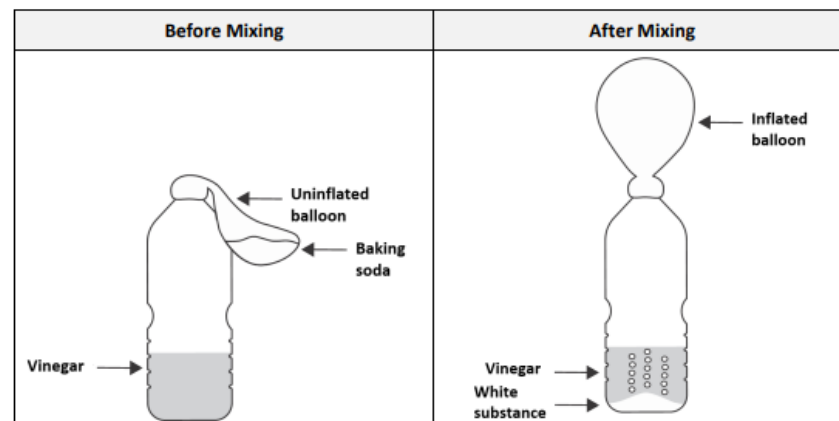
This task is about the results of mixing solids with liquids.

Task

Ms. Kim's students are learning about matter. Matter can be a liquid, solid, or gas. Ms. Kim plans to show what can happen when a liquid and solid are mixed together. Vinegar is a clear liquid. Baking soda is a white powder.

Prompt 1

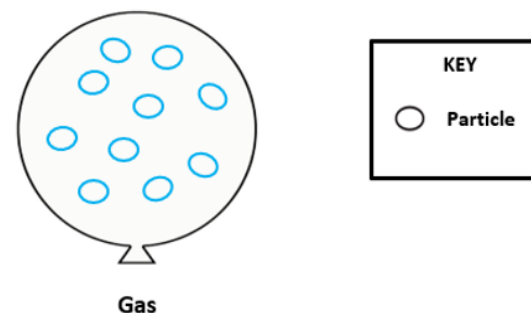
Before mixing, Ms. Kim pours some vinegar into a bottle. Then she places some baking soda into an uninflated balloon. Next, she attaches the balloon to the top of the bottle. To mix the two materials, Ms. Kim lifts the balloon and the baking soda falls into the vinegar.



Part A.

After mixing the vinegar and baking soda, bubbles form. The balloon begins to expand. Ms. Kim tells the students that the gas from the bubbles fills the balloon.

In the space below, draw the arrangement of the particles **in the balloon after mixing**. Use the symbol of a particle in the key to draw the particles.



Part B.

Ms. Kim tells the students that when materials are mixed, they can make a gas. Gases cannot be seen.

Use your particle arrangement drawing to explain why the students cannot see the gas particles inside the balloon.

Gas is produced. The gas fills and inflates the balloon. The students cannot see the gas particles because they are very tiny. Like in my drawing, gas particles fill up the space in the balloon because they are spread far apart.

Task 1 Prompt 1 Parts A and B Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... - Requires integration of two dimensions in the service of sensemaking - Requires a combination of previously learned ideas or concepts and newly presented information
Complexity of the Presentation	Moderate	- The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts - Provides graphics/data/models - Phenomenon or problem presented with some level of uncertainty
Cognitive Demand of Response Development	Moderate	- Requires application of ideas and practices given cues and guidance - Requires drawing relationships and connecting ideas and practices - Response requires a moderate level of sophistication with typical but relatively complex representation of ideas and application of skills
Cognitive Demand of Response Production	Moderate	Responses include one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

Task 1 Prompt 1 Parts A and B	
Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
Part A - Students read the task scenario and observe the illustrations of the uninflated balloon and the inflated balloon before and after pouring baking soda into the uninflated balloon. - Students conclude that matter that cannot be seen but can be detected in other ways. - Students conclude that gas particles have mass and take up space. - Students select and identify relevant aspects of the task situation to include in their model and draw the arrangement of particles in the balloon after mixing. Part B - Students refer to their particle arrangement model to reason about the phenomenon. - Students use their particle arrangement to describe and explain the phenomena that gas particles are too small to be seen. - Students use their particle arrangement to describe and explain the phenomena that gas particles fill up space in the balloon.	
Formative Assessments	Opportunities to Learn
Segment 1, pp. 8 <i>Informal Assessment: Classroom Check-ins About Particle Theory of Matter (A4)</i> Students develop a model that accurately represents that the particles of a substance in multiple quantities are the same and made up of particles too small to be seen.	Segment 1, pp. 25-26 <i>What is Air? (A4)</i> Students gather observations and data that show how air, a gas, is made of matter and has weight, takes up space, and has certain properties.

Task 1 Prompt 1 Parts A and B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 1, p. 10 <i>Informal Assessment: Annotated Drawings: Particle Theory of Matter (A4, A5)</i> - Students accurately identify information in a model or evidence that describes appropriate properties of air as having mass, taking up space, and being made of particles too small to be seen and spread apart. Segment 1, pp. 10-11 <i>Formal Assessment: What is Air? (A4, A5)</i> - Students develop a model that accurately represents that the substances are made up of particles that are too small to be seen. - Students accurately identify and/or describe the evidence that supports a claim that substances are made up of particles that are too small to be seen.	Segment 1, pp. 26-27 <i>Zooming in on Air (A4, A5)</i> - Students draw a model that connects to the anchoring phenomenon. - After viewing a simulation, students discuss that matter is made of particles that are too small to be seen. - Students consider how molecules look in solids, liquids, and gases. Segment 1, pp. 27-28 <i>Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A4, A5)</i> - Students engage in a state of matter characteristic card sort and discuss characteristics of solids, liquids, and gases. - Students discuss the particle nature of matter, create a visual model of the arrangement of particles in each state, and construct a written explanation to support the claim that when matter changes state, it is still composed of the same particles.

Task 1 Prompt 1 Parts A and B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
- Construct an explanation to accurately support a claim that substances are made of particles that are too small to be seen. Segment 1, pp. 12-13 <i>Formal Assessment: How Did We Make a Cloud in Our Mouth? (A4, A5)</i> - Students develop a model that accurately represents that the substances are made up of particles that are too small to be seen. - Students accurately identify and/or describe the evidence that supports a claim that substances are made up of particles that are too small to be seen. - Students construct an explanation to accurately support a claim that substances are made of particles that are too small to be seen.	Segment 1, p. 28 <i>How Did We Make a Cloud in Our Mouth? (A4, A5)</i> Students create an explanatory model/explanation that uses their annotated drawings, observations, numeric data, and reasoning to develop an explanation of what led to the cloud being formed in their mouth.

Prompt 1 – Part C

Performance Category: Model the Structure of Matter

Acquisition Goals

- **A4.** Develop or use a model that shows that a substance, regardless of the quantity, is made up of particles too small to be seen.*
- **A5.** Construct an explanation to support the claim that substances are made up of particles too small to be seen.
- **A10.** Construct an explanation to support the claim that when matter changes state, it is still composed of the same particles (that were in the previous state).

Prompt 1 Part C measures students' ability to:

- Develop or use models to support descriptions of how matter is made of particles too small to be seen.

Part C.

Ms. Kim tells the students that we can see solids and liquids. Solids and liquids are also made of particles like gases. Then, a student says the following:

The particles of solids and liquids are arranged the same as gases. We can see solids and liquids because their particles are much bigger than gas particles.

Do you agree with the student's description of why we can see solids and liquids?

Circle your answer.

YES

NO

Use what you know about the arrangement **AND** size of particles of matter to explain your answer.

I disagree because all matter is made of particles too small to be seen. That means I can't see the particles of solids and liquids or gases. The reason why I can see a solid or liquid is because of the arrangement of the particles. Because gas particles are spread far apart is why gas cannot be seen. I can see solids and liquids because the particles are close together, but I would not be able to see a single particle. It would be too small.

Task 1 Prompt 1 Part C Complexity		
Degree and Nature of Sensemaking	Low	This prompt... • Requires one or two dimensions • One dimension may have a greater degree of emphasis than another • Requires previously learned ideas or concepts
Complexity of the Presentation	Low	• The amount and type of information provided in the scenario supports limited simple connections among ideas or concepts • Phenomenon or problem presented in a concrete way with high level of certainty
Cognitive Demand of Response Development	Moderate	• Requires drawing relationships and connecting ideas and practices • Response requires a moderate level of sophistication with typical but relatively complex representation of ideas and application of skills
Cognitive Demand of Response Production	Moderate	• Response includes one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

Task 1 Prompt 1 Part C Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
- Students conclude that gas particles are spread far apart, which is why gas cannot be seen, and that particles in solids and liquids are close together, which is why they can be seen. - Students use their conclusion that all matter, including gas, is made of particles too small to be seen and their knowledge of the arrangement of particles of matter to explain why solids and liquids are visible but gases are not.	
Formative Assessments	Opportunities to Learn
Segment 1, p. 9 <i>Informal Assessment: Annotated Drawings: Particle Theory of Matter (A5, A10)</i> - Students construct an explanation to accurately support a claim that a given substance in different states of matter is made up of the same particles too small to be seen. Segment 1, pp. 9-10 <i>Formal Assessment: Conducting Investigations on the States of Matter (A5, A10)</i> - Students construct an explanation to accurately support a claim that a given substance in different states of matter is made up of the same particles too small to be seen.	Segment 1, p. 26 <i>Zooming in on Air (A4, A5)</i> - Students explore a simulation of moving air particles and discuss that matter is made of particles too small to be seen. - Students observe different states of matter and consider how the molecules look in solids, liquids, and gases. Segment 1, pp. 27-28 <i>Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A4, A5, A10)</i> - Students engage in a state of matter characteristic card sort and discuss characteristics of solids, liquids, and gases.

Task 1 Prompt 1 Part C Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
- Draw appropriate conclusions from data about the properties of solids, liquids, and gases. Segment 1, pp. 10-11 <i>Formal Assessment: Conducting Investigations on the States of Matter (A5, A10)</i> - Students accurately identify and/or describe the evidence that supports a claim that a given substance in different states of matter is made up of the same particles too small to be seen. - Students construct an explanation to accurately support a claim that a given substance in different states of matter is made up of the same particles too small to be seen.	- Students discuss the particle nature of matter, create a visual model of the arrangement of particles in each state, and construct a written explanation to support a claim that when matter changes state, it is still composed of the same particles. Segment 1, p. 28 <i>How Did We Make a Cloud in Our Mouth? (A4, A5, A10)</i> - Students create an explanatory model/explanation that uses their annotated drawings, observations, numeric data, and reasoning to develop an explanation of what led to the cloud being formed in their mouth.

Task 1 Prompt 1 Part C Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 1, pp. 11-12 <i>Formal Assessment: Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A4*, A10)</i> - Students accurately identify and/or describe the information in a model that supports the idea that substances in different states of matter are made up of particles too small to be seen. - Students use information provided in a model to accurately explain that substances in different states of matter are made up of the same particles too small to be seen. - Students construct an explanation to accurately support a claim that a given substance in different states of matter is made up of the same particles too small to be seen.	

Task 1 Prompt 1 Part C Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 1, pp. 12-13 <i>Formal Assessment: How Did We Make a Cloud in Our Mouth? (A4, A5, A10)</i> - Students develop a model that accurately represents that the substances are made up of particles too small to be seen. - Students accurately identify and/or describe the evidence that supports a claim that substances are made up of particles too small to be seen. - Students construct an explanation to accurately support a claim that substances are made up of particles too small to be seen. - Students accurately identify and/or describe the information in a model that supports the idea that substances in different states of matter are made up of particles too small to be seen. - Students use the information provided in a model to accurately explain that substances in different states of matter are made up of particles too small to be seen.	

Prompt 2

Performance Category: Use Observations and Measurements of Properties of Matter

Acquisition Goals

- **A1.** Describe how properties of matter can be used to compare and contrast materials.
- **A3.** Conduct an investigation to measure and/or qualitatively describe the properties of substances.
- **A6.** Conduct an investigation to identify a substance by measuring and/or qualitatively describing certain properties of substances.

Prompt 2 measures students' ability to:

- Use observations and measurements as evidence to describe how to develop a procedure to identify materials based on their properties.

Prompt 2

Ms. Kim provides Table 1. It shows the properties of three solids. It also shows reactions, or changes, when each of the solids is mixed with water or vinegar.

Table 1. Material Properties

Solid	Description of Appearance	Mixed with Water	Mixed with Vinegar
Baking Soda	White powder	Dissolves	Forms bubbles
Corn Starch	White powder	Forms a white mixture	Forms a white mixture
Powdered Sugar	White powder	Dissolves	Dissolves

Next, Ms. Kim shows the students three unknown solids. Ms. Kim tells the class each of the unknown solids is one of the solids in Table 1.

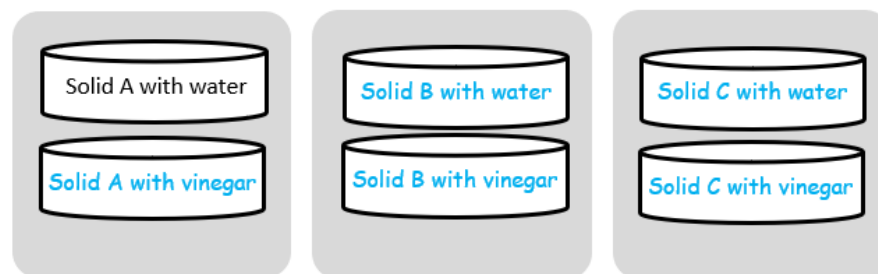
The unknown solids are labeled as:

- Solid A
- Solid B
- Solid C

Ms. Kim asks the students to think of a way to identify the unknown solids.

Complete **Diagram 1** with mixtures of unknown solids, water, and vinegar that can be used to identify the unknown solids. One mixture is filled in.

Diagram 1. Mixtures of Unknown Solids with Liquids



Task 1 Prompt 2 Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... Required integration of two dimensions in the service of sense-making
Complexity of the Presentation	Moderate	- The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts - Provides graphics/data/models - Phenomenon or problem presented with some level of uncertainty
Cognitive Demand of Response Development	Moderate	- Requires application of ideas and practices given cues and guidance - Requires drawing relationships and connecting ideas and practices
Cognitive Demand of Response Production	Low	Responses include selection from a small set of options presented as text (e.g., word, short phrase) or other formats (e.g., a simple graphic or process)

Task 1 Prompt 2	
Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development - Students read through Table 1, which serves as the basis for evidence for an explanation of the phenomenon. - Students identify the purpose of the investigation. - Students conclude that properties can be used to identify materials and that properties may include changes in response to other properties as observable and measurable properties. - Students use Table 1, which shows the properties of three solids, to identify the mixtures that can be used to identify the unknown solids.	
Formative Assessments	Opportunities to Learn
Segment 2, p. 13 <i>Informal Assessment: Matter and Its Properties (A1, A3, A6)</i> - Students identify and/or describe appropriate properties of matter to use when comparing and contrasting materials. - Students accurately identify and/or describe properties of matter after combining substances. - Students accurately compare and contrast properties of matter before and after combining substances. - Students draw appropriate conclusions from data about the properties of a	Segment 2, p. 29 <i>What is This? (A1, A3*, A6)</i> - Students engage in a class discussion of the different types of properties that can be used to describe substances, including both characteristic properties (e.g., solubility, flammability, odor, heat conductivity, magnetism) and non-characteristic properties (e.g., weight, volume). - Students plan an investigation to describe the properties of given substances.

Task 1 Prompt 2 Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 2, p. 14 <i>Formal Assessment: Investigating the Mystery Matter (A3, A6)</i> - Accurately describe the procedure for an investigation to determine the properties of a substance. - Make appropriate observations and/or measurements to produce data that will help identify a substance. - Identify and/or describe appropriate patterns in data on the properties of a substance.	Segment 2, p. 29 <i>What Could it Be? (A1, A3, A6)</i> - Students carry out their planned investigation and record data to organize the different properties of different materials. - Students construct explanations about how properties of matter can be used to compare and contrast materials.

Prompt 3

Performance Category: Use Observations and Measurements of Properties of Matter

Acquisition Goals

- A1.** Describe how properties of matter can be used to compare and contrast materials.
- A2.** Use mathematical and computational thinking on the properties of substances to identify a substance.
- A3.** Conduct an investigation to measure and/or qualitatively describe the properties of substances.
- A6.** Conduct an investigation to identify a substance by measuring and/or qualitatively describing certain properties of substances.

Prompt 3 measures students' ability to:

- Use observations and measurements as evidence to describe how to develop a procedure to identify materials based on their properties.

Prompt 3

Which mixtures and observations must be collected to determine that **Solid B** is powdered sugar? Use **Table 1** and **Diagram 1** to support your explanation.

I would mix **Solid B** with *each of the liquids* because *powdered sugar dissolves in both water and vinegar*.

I will know **Solid B** is powdered sugar if *the powder dissolves in both liquids, and there is no reaction*.

OR

I would mix **Solid B** with *vinegar* because *only powdered sugar dissolves in vinegar*.

I will know **Solid B** is powdered sugar if *the powder dissolves in vinegar, and there is no reaction, and no white substance is formed*.

Task 1 Prompt 3 Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... Required integration of two dimensions in the service of sense-making
Complexity of the Presentation	Low	- The amount and type of information provided in the scenario supports limited simple connections among ideas or concepts - Provides few, simple graphics/data/models - Phenomenon or problem presented in a concrete way with high level of certainty
Cognitive Demand of Response Development	Moderate	- Requires application of ideas and practices given cues and guidance - Requires drawing relationships and connecting ideas and practices
Cognitive Demand of Response Production	High	Responses include multiple paragraphs, multiple graphics of at least moderate complexity, or multiple steps in a complex process

Task 1 Prompt 3 Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
- Students refer to Table 1 and Diagram 1, which serve as the basis for evidence for an explanation of the phenomenon. - Students identify the purpose of the investigation. - Students conclude that properties can be used to identify materials and that properties may include changes in response to other properties as observable and measurable properties. - Students use Table 1 and Diagram 1 to determine which mixtures and observations must be collected to determine that Solid B is powdered sugar.	
Formative Assessments	Opportunities to Learn
Segment 2, p. 13 <i>Informal Assessment: Matter and Its Properties (A1, A3, A6)</i> - Students accurately identify and/or describe properties of matter after combining substances. - Students accurately compare and contrast properties of matter before and after combining substances. - Students draw appropriate conclusions from data about the properties of a substance.	Segment 2, p. 29 <i>What is This? (A1, A2, A3, A6)</i> - Students engage in a class discussion of the different types of properties that can be used to describe substances, including both characteristic properties (e.g., solubility, flammability, odor, heat conductivity, magnetism) and non-characteristic properties (e.g., weight, volume). - Students plan an investigation to describe the properties of given substances. Segment 2, p. 29 <i>What Could it Be? (A1, A2, A3, A6)</i> - Students carry out their planned investigation and record data to organize the different properties of

Task 1 Prompt 3	
Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 2, p. 14 <i>Formal Assessment: Investigating the Mystery Matter (A2, A3, A6)</i> - Students identify and/or describe appropriate patterns in data on the properties of a substance. - Students make appropriate observations and/or measurements to produce data that will help identify a substance. - Students draw appropriate conclusions from data about the identity of a substance. Segment 2, pp. 14-15 <i>Formal Assessment: What's the Mystery Matter? (A2, A3*)</i> - Students make appropriate observations and/or measurements to produce data that will help identify a substance. - Students identify and/or describe appropriate patterns in data on the properties of a substance. - Students draw appropriate conclusions from data about the identity of a substance.	- Students construct explanations about how properties of matter can be used to compare and contrast materials. Segment 2, p. 30 <i>What is the Mystery Matter? (A2, A6)</i> - Students use observations and evidence to explain the physical properties of a mystery substance and identify what the substance is made of.

Future Learning Connected to evidence elicited in Task 1

Crosscutting Concepts

- In Unit 1, students focus on Cause & Effect and Scale, Proportion, and Quantity. Cause and Effect lies at the heart of science. Cause and Effect is also closely associated with the practice of “Engaging in Argument from Evidence.” In Unit 2, students will “Develop and use Models” of ecosystems and food webs to construct and support evidence-based “Arguments” that center around ecosystems. An understanding of Scale involves not only understanding systems and processes vary in size, time span, and energy, but also different mechanisms operate at different scales. The crosscutting concept of Scale, Proportion, and Quantity are essential considerations when deciding how to model a phenomenon and figures prominently in the practice of “Analyzing and Interpreting Data.” In Unit 2, students will explore the needs of plants, and use that data to refine their explanatory model to create scientifically accurate explanations. The Unit 1 Crosscutting Concepts serve as a starting point for students to understand what they will use to understand and make sense of phenomena explained in Unit 2, such as matter being transported into, out of, and within systems.

Disciplinary Core Ideas

- In Unit 1, students learn that matter is made up of particles too small to be seen and that mass is conserved. This will help students build future understanding in Unit 2 students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment. In Unit 2, Acquisition Goal 12 requires students to develop a model to describe how matter cycles among living and non-living components within an ecosystem. Students are given a variety of biotic and abiotic (living and nonliving) picture cards and create a model of how matter moves through an ecosystem. (*Formal Assessment: Movement of Matter Through an Ecosystem: Can You Show It?, pp. 14-15*)

Science and Engineering Practices

- In Unit 1, students experience developing and using models to illustrate that substances are composed of particles and/or particle motion. In Unit 2, they use their experience building descriptive models to help them as they model different concepts. In Unit 2, Acquisition Goal 6 requires students to use a model to describe that plants form the foundation of the food web. Students progressively add to an explanatory model of the owl/predator’s food web using the knowledge they gain from looking at what animals eat and do with that food. (*Formal Assessment: Modeling Energy and Food Webs, pp. 9-10*)
- In Unit 1, students conduct investigations to collect data that can be used as evidence for their claims, and they develop models to describe phenomena. These experiences working with models, data, and evidence help prepare them for engaging in an argument that makes use of these three forms of scientific information. In Unit 2, Acquisition Goal 10 requires students to engage in an argument from evidence about the role of sunlight in the process of making food by plants. Students are presented with plants that they watch over time in various conditions, with individual groups selecting different variables. The data from the experiments will give students the opportunity to describe the pattern of the role that each of these variables has on plant growth. (*Formal Assessment: Conditions for Plant Growth, pp. 12-13*)

SIPS Grade 5 Unit 1 EOU Assessment Task 2: What Just Happened?

Prompt 1 – Part A

Performance Category: Model the Structure of Matter

Acquisition Goals

- **A4.** Develop or use a model that shows that a substance, regardless of the quantity, is made up of particles too small to be seen.
- **A13.** Develop or use a model to determine if substances in different states of matter are made of particles that are too small to be seen.

Prompt 1 Part A measures students' ability to:

- Develop or use models to support descriptions of how condensation, the movement of water particles in the air to a surface, demonstrates that matter is made from particles that are too small to see.

Student Worksheet

This task is about properties of matter.

Task

Have you ever reached for a glass of ice water to have the glass slip from your hand? When you pour the water over the ice, the glass is dry on the outside. But when you pick it up later, the outside of the glass is covered with water droplets. Condensation occurs when water vapor cools and forms water droplets on a surface.

The pictures below show Glass 1 with no ice and Glass 2 with ice.

- Each glass is the same size.
- Each glass is filled with the same amount of room temperature water.
- Ice cubes are only added to **Glass 2**.

Glass 1 with No Ice



Glass 2 with Ice



After a few minutes, there is no change to Glass 1.

After a few more minutes, water droplets form on the surface of Glass 2.

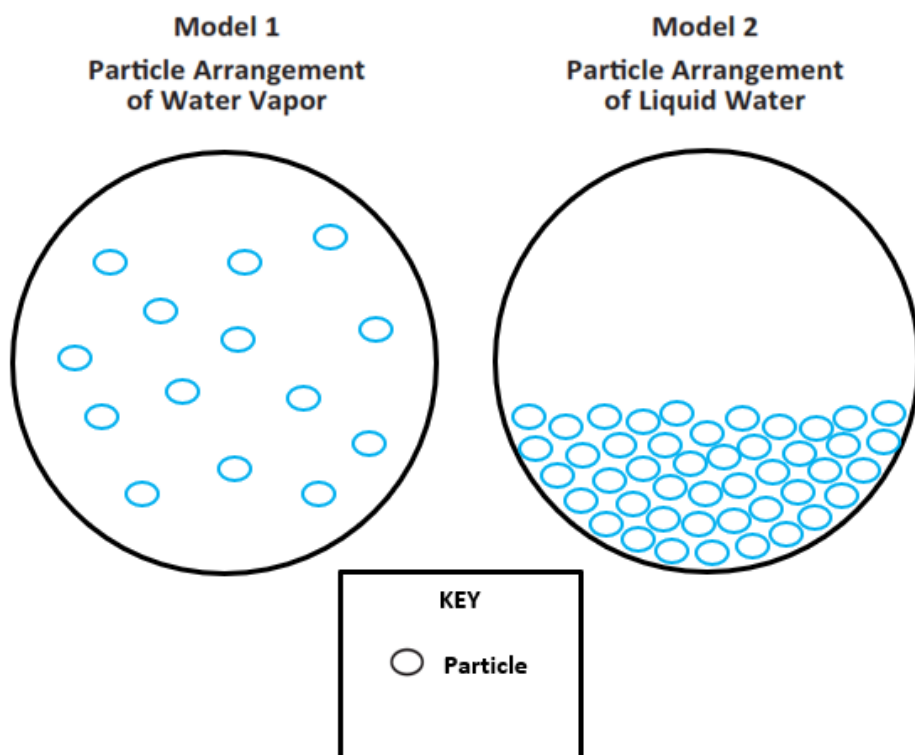
Prompt 1

Part A.

Condensation happens when particles in a gas cool down. As the gas particles cool, they begin to move closer together. Finally, the particles form a liquid.

When water is a gas, it is called water vapor. When water vapor cools, it forms liquid water.

- Use **Model 1** to draw the particle arrangement of water particles in water vapor.
- Use **Model 2** to draw the particle arrangement of water particles in liquid water.
- Use the symbol of a particle in the key to draw the particles.



Task 2 Prompt 1 Part A Complexity		
Degree and Nature of Sensemaking	Moderate	This task... • Requires integration of two dimensions in the service of sense-making • Requires a combination of previously learned ideas or concepts and newly presented information
Complexity of the Presentation	Low	• The amount and type of information provided in the scenario supports limited simple connections among ideas or concepts • Provides few, simple graphics/data/models • Phenomenon or problem presented in a concrete way with high level of certainty
Cognitive Demand of Response Development	Low	• Requires well-defined set of actions or procedures • Response requires a low level of sophistication with routinely encountered well-practiced applications
Cognitive Demand of Response Production	Moderate	• Responses include one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

Task 2 Prompt 1 Part A Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
- Students review the provided informational text and model about condensation. - Students use the provided information about condensation and apply this definition to what they have learned about water vapor and liquid water. - Students develop a model to describe what happens to the particle arrangement of water particles in water vapor and liquid water.	
Formative Assessments	Opportunities to Learn
Segment 1, p. 9 <i>Informal Assessment: Annotated Drawings: Particle Theory of Matter (A4, A13)</i> - Students identify information in a model/evidence that describes appropriate properties of air as having mass, taking up space, and being made of particles too small to be seen and spread apart. - Students identify information in a model/evidence that describes appropriate properties of liquids as having mass, taking up space, and being made of particles close together but able to move about.	Segment 1, pp. 26-27 <i>Zooming in on Air (A4)</i> - Students observe a simulation of air particles moving around and different states of matter and consider how molecules look in solids, liquids, and gases. Segment 1, pp. 27-28 <i>Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A4, A13)</i> - Students engage in a state of matter characteristic card sort and discuss characteristics of solids, liquids, and gases. - Students discuss the particle nature of matter and create a visual model of the arrangement of particles in each state.

Task 2 Prompt 1 Part A Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 1, pp. 11-12 <i>Formal Assessment: Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A4*, A13)</i> - Students accurately identify and/or describe the information in a model that supports the idea that substances in different states of matter are made up of particles that are too small to be seen. - Students use the information provided in a model to accurately explain that substances in different states of matter are made up of particles that are too small to be seen. Segment 1, pp. 12-13 <i>Formal Assessment: How Did We Make a Cloud in Our Mouth? (A4, A13)</i> - Students develop a model that accurately represents that the substances are made up of particles that are too small to be seen.	Segment 1, p. 28 <i>How Did We Make a Cloud in Our Mouth? (A4, A13)</i> Students develop an explanation using logic and reasoning to describe a phenomenon.

Prompt 1 – Part B

Performance Category: Model the Structure of Matter

Acquisition Goals

- **A10.** Construct an explanation to support the claim that when matter changes state, it is still composed of the same particles (that were in the previous state).
- **A13.** Develop or use a model to determine if substances in different states of matter are made of particles that are too small to be seen.

Prompt 1 Part B measures students' ability to:

- Develop or use models to support descriptions of how condensation, the movement of water particles in the air to a surface, demonstrates that matter is made from particles that are too small to see.

Part B.

Explain how the process of condensation supports the idea that all single water particles are too small to be seen. Use your particle arrangement drawings to support your response.

When condensation happens, the water particles in water vapor cool and move closer together. Then it becomes liquid water droplets on the glass. That means the water particles in a gas that I cannot see are the same water particles that form liquid water. My drawings show how the water particles are spread out more in a gas than in a liquid. That is why I can see liquid water. But I can't see single water particles because each one is too small to be seen.

Task 2 Prompt 1 Part B Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... • Requires integration of two dimensions in the service of sensemaking • Requires a combination of previously learned ideas or concepts and newly presented information
Complexity of the Presentation	Low	• The amount and type of information provided in the scenario supports limited simple connections among ideas or concepts • Phenomenon or problem presented in a concrete way with high level of certainty
Cognitive Demand of Response Development	Moderate	• Requires drawing relationships and connecting ideas and practices • Requires a moderate level of sophistication with typical and relatively complex representation of ideas and application of skills
Cognitive Demand of Response Production	High	• Responses include multiple paragraphs, multiple graphics of at least moderate complexity, or multiple steps in a complex process

Task 2 Prompt 1 Part B Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
- To explain what happens during condensation, students reason about the relationships between different components of the model. - Students use their particle arrangement models to reason about the phenomenon that all single water particles are too small to be seen. - Students describe that all water particles are too small to be seen and understand that when matter changes state, it is still composed of the same particles.	
Formative Assessments	Opportunities to Learn
Segment 1, p. 9 <i>Informal Assessment: Annotated Drawings: Particle Theory of Matter (A10, A13)</i> - Students accurately identify information in a model/evidence that describes properties of air as having mass, taking up space, and being made of particles too small to be seen and spread apart. - Students accurately identify information in a model/evidence that describes properties of liquids as having mass, taking up space, and being made of particles close together but able to move about. - Students construct an explanation to accurately support a claim that a given substance in different states of matter is made of the same particles that are too small to be seen.	Segment 1, pp. 27-28 <i>Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A10, A13)</i> - Students engage in a state of matter characteristic card sort and discuss characteristics of solids, liquids, and gases. - Students discuss the particle nature of matter and create a visual model of the arrangement of particles in each state. Segment 1, p. 28 <i>How Did We Make a Cloud in Our Mouth? (A10, A13)</i> - Students develop an explanation using logic and reasoning to describe a phenomenon.

Task 2 Prompt 1 Part B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 1, p. 11-12 <i>Formal Assessment: Three States of Water: Ice, Steam, and Liquid. Are They All the Same? (A10, A13)</i> - Students accurately identify and/or describe the information in a model that supports the idea that substances in different states of matter are made up of particles that are too small to be seen. - Students use the information provided in a model to accurately explain that substances in different states of matter are made up of particles that are too small to be seen. - Students construct an explanation to accurately support a claim that a given substance in different states of matter is made up of the same particles that are too small to be seen.	

Task 2 Prompt 1 Part B	
Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 1, pp. 12-13 <i>Formal Assessment: How Did We Make a Cloud in Our Mouth? (A10, A13)</i> - Students construct an explanation to accurately support a claim that substances are made up of particles that are too small to be seen. - Students use the information provided in a model to accurately explain that substances in different states of matter are made up of particles that are too small to be seen.	

Prompt 2

Performance Category: Use Observations and Measurements of Properties of Matter

Acquisition Goals

- **A1.** Describe how properties of matter can be used to compare and contrast materials.
- **A2.** Use mathematical and computational thinking on the properties of substances to identify a substance.

Prompt 2 measures students' ability to:

- Use observations and measurements as evidence to describe how data can be used to support an explanation of the identification of materials.

Prompt 2

Materials can be identified by their properties. One property is how long it takes heat to flow through a material.

An investigation is conducted to measure how quickly heat flows through three different materials used to make drinking containers. Each container is filled with the same amount of water. For each of the three containers:

- The starting temperature of the water is measured.
- After 20 minutes, the final temperature of the water is measured.
- The total amount of heat loss is calculated.

Table 1 describes the observable properties of the three different drinking containers **A**, **B**, and **C**. It also shows the property of heat flow as the amount of heat lost by the water in each drinking container after 20 minutes.

Table 1. Properties of Drinking Containers

Drinking Container	Property of Material	Amount of Heat Lost (in Degrees Fahrenheit)
A	• clear, blue color • stiff	41°F
B	• white color • bends slightly • goes back into shape without breaking	38°F
C	• bright silver • bendable • bending results in a dent	48°F

Materials with high heat flow lose heat much faster than materials with low heat flow.

Use **Table 1** to identify the drinking container with the **highest** rate of heat flow. Compare data from all three drinking containers to explain your answer.

The drinking container with the **highest** rate of heat flow is **C**.

I know this because **Container C lost the most amount of heat from start to finish.**

Task 2 Prompt 2 Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... - Requires integration of two dimensions in the service of sensemaking - Requires a combination of previously learned ideas or concepts and newly presented information
Complexity of the Presentation	Moderate	- The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts - Provides graphics/data/models
Cognitive Demand of Response Development	Low	- Requires well-defined set of actions or procedures - Requires a connection or retrieval of factual information - Response requires a low level of sophistication with routinely encountered well-practiced applications
Cognitive Demand of Response Production	Moderate	Response includes one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

Task 2 Prompt 2 Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
- Students read the provided text to identify the purpose of the investigation. - Students conclude that measurements of a variety of properties can be used to identify materials and that properties can be measured. - Students reference Table 1 to use data from the investigation as evidence for explaining which drinking container has the highest rate of heat flow based on its observable properties. - Students describe physical quantities such as temperature and understand the units used to measure and compare quantities. - Students conclude that Container C lost the most amount of heat from start to finish and therefore has the highest rate of flow.	
Formative Assessments	Opportunities to Learn
Segment 2, p. 13 <i>Informal Assessment: Matter and Its Properties (A1)</i> - Students accurately identify and/or describe appropriate properties of matter to use when comparing and contrasting materials. - Students draw appropriate conclusions from data about the properties of a substance.	Segment 2, p. 29 <i>What is This? (A1, A2)</i> Students engage in a class discussion of the different types of properties that can be used to describe substances, including both characteristic properties (e.g., solubility, flammability, odor, heat conductivity, magnetism) and non-characteristic properties (e.g., weight, volume).

Task 2 Prompt 2	
Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 2, p. 14 <i>Formal Assessment: Investigating the Mystery Matter (A2)</i> - Students identify and/or describe appropriate patterns in data on the properties of a substance. - Students draw appropriate conclusions from data about the identity of a substance. Segment 2, pp. 14-15 <i>Formal Assessment: What is the Mystery Matter? (A2)</i> - Students identify and/or describe appropriate patterns in data on the properties of a substance. - Students draw appropriate conclusions from data about the identity of a substance.	Segment 2, p. 30 <i>What Could it Be? (A1, A2)</i> - Students make observations and take measurements on different types of properties (e.g., magnetism, volume, weight, color, odor, solubility in water, etc.). Students record data in tables to organize the different properties of the different materials. After gathering the data, students work in small groups to construct an explanation about how properties of matter can be used to compare and contrast materials. Segment 2, p. 30 <i>What is the Mystery Matter? (A2)</i> - Students identify the mystery matter by making connections between the physical properties of the mystery matter and the physical properties they observed. Students explain what the mystery matter is made of using previously collected evidence.

Prompt 3 – Parts A and B

Performance Categories: Use Observations and Measurements of Properties of Matter

Acquisition Goals:

- **A1.** Describe how properties of matter can be used to compare and contrast materials.
- **A2.** Use mathematical and computational thinking on the properties of substances to identify a substance.

Prompt 3 Parts A and B measure students’ ability to:

- Use observations and measurements as evidence to describe how data can be used to support an explanation of the identification of materials.

Part A.

Table 2 shows the properties of three different materials used to make drinking containers.

Table 2. Properties of Drinking Container Materials

Material	Properties
Foam	• extremely light weight and flexible • usually white in color • very low heat flow
Metal	• moderately light material • shiny surface • high heat flow
Plastic	• light weight material • may be transparent • low heat flow

Use the results from **Table 1** and information from **Table 2** to identify the material used to make **one** of the drinking containers used in the investigation. Compare the data from all three drinking containers to explain how you identified the material.

The material used to make **Drinking Container A** is **plastic**. I know this because **it is stiff and has a clear blue color. Of the three containers, it was second best at keeping the temperature of the water warm.**

OR

The material used to make **Drinking Container B** is **foam**.

I know this because **it is described as white in color and loses the least amount of heat or has very low heat flow.**

OR

The material used to make **Drinking Container C** is **metal**. I know this because **it has a shiny silver surface and loses the most amount of heat or has a high rate of heat flow.**

Task 2 Prompt 3 Parts A and B Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... - Requires integration of two dimensions in the service of sensemaking - Requires a combination of previously learned ideas or concepts and newly presented information
Complexity of the Presentation	Moderate	- The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts - Provides graphics/data/models
Cognitive Demand of Response Development	High	- Requires selection and application of multiple complex ideas and practices - Requires high degree of sensemaking, reasoning, and/or transfer - Response requires a high level of sophistication with non-routine or abstract representation of ideas and application of skills
Cognitive Demand of Response Production	Moderate	Response includes one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

Task 2 Prompt 3 Parts A and B Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
Part A - Students read the provided text to identify the purpose of the investigation. - Students conclude that measurements of a variety of properties can be used to identify materials and that properties can be measured. - Students reference Table 1 and Table 2 to use data from the investigation as evidence to identify and explain the material used to make a drinking container based on its observable properties. - Students can describe physical quantities such as temperature and understand the units used to measure and compare quantities. - Students conclude what material a drinking container is made of and use data to support their explanation. Part B - Students explain the most useful measurements and observations provided in the tables to identify the material of the drinking container.	
Formative Assessments	Opportunities to Learn
Segment 2, p. 13 <i>Informal Assessment: Matter and Its Properties (A1)</i> - Students accurately identify and/or describe appropriate properties of matter to use when comparing and contrasting materials. - Students draw appropriate conclusions from data about the properties of a substance.	Segment 2, p. 29 <i>What is This? (A1, A2)</i> Students engage in a class discussion of the different types of properties that can be used to describe substances, including both characteristic properties (e.g., solubility, flammability, odor, heat conductivity, magnetism) and non-characteristic properties (e.g., weight, volume).

Task 2 Prompt 3 Parts A and B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 2, p. 14 <i>Formal Assessment: Investigating the Mystery Matter (A2)</i> - Students identify and/or describe appropriate patterns in data on the properties of a substance. - Students draw appropriate conclusions from data about the identity of a substance. Segment 2, pp. 14-15 <i>Formal Assessment: What is the Mystery Matter? (A2)</i> - Students identify and/or describe appropriate patterns in data on the properties of a substance. - Students draw appropriate conclusions from data about the identity of a substance.	Segment 2, p. 30 <i>What Could it Be? (A1, A2)</i> - Students make observations and take measurements on different types of properties (e.g., magnetism, volume, weight, color, odor, solubility in water, etc.). Students record data in tables to organize the different properties of the different materials. After gathering the data, students work in small groups to construct an explanation about how properties of matter can be used to compare and contrast materials. Segment 2, p. 30 <i>What is the Mystery Matter? (A2)</i> - Students identify the mystery matter by making connections between the physical properties of the mystery matter and the physical properties they observed. Students explain what the mystery matter is made of using previously collected evidence.

Future Learning Connected to evidence elicited in Task 2

Crosscutting Concepts

- In Unit 1, students focus on Cause & Effect and Scale, Proportion, and Quantity. Cause and Effect lies at the heart of science. Cause and Effect is also closely associated with the practice of “Engaging in Argument from Evidence.” In Unit 2, students will “Develop and use Models” of ecosystems and food webs to construct and support evidence-based “Arguments” that center around ecosystems. An understanding of Scale involves not only understanding systems and processes vary in size, time span, and energy, but also different mechanisms operate at different scales. The crosscutting concept of Scale, Proportion, and Quantity are essential considerations when deciding how to model a phenomenon and figures prominently in the practice of “Analyzing and Interpreting Data.” In Unit 2, students will explore the needs of plants, and use that data to refine their explanatory model to create scientifically accurate explanations. The Unit 1 Crosscutting Concepts serve as a starting point for students to understand what they will use to understand and make sense of phenomena explained in Unit 2, such as matter being transported into, out of, and within systems.

Disciplinary Core Ideas

- In Unit 1, students learn that matter is made up of particles too small to be seen and that mass is conserved. This will help students build future understanding in Unit 2, students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment. In Unit 2, Acquisition Goal 12 requires students to develop a model to describe how matter cycles among living and non-living components within an ecosystem. Students are given a variety of biotic and abiotic (living and nonliving) picture cards and create a model of how matter moves through an ecosystem. (*Formal Assessment: Movement of Matter Through an Ecosystem: Can You Show It?, pp. 14-15*)

Science and Engineering Practices

- In Unit 1, students experience developing and using models to illustrate that substances are composed of particles and/or particle motion. In Unit 2, they use their experience building descriptive models to help them as they model different concepts. In Unit 2, Acquisition Goal 6 requires students to use a model to describe that plants form the foundation of the food web. Students progressively add to an explanatory model of the owl/predator’s food web using the knowledge they gain from looking at what animals eat and do with that food. (*Formal Assessment: Modeling Energy and Food Webs, pp. 9-10*)
- In Unit 1, students conduct investigations to collect data that can be used as evidence for their claims, and they develop models to describe phenomena. These experiences working with models, data, and evidence help prepare them for engaging in an argument that makes use of these three forms of scientific information. In Unit 2, Acquisition Goal 10 requires students to engage in an argument from evidence about the role of sunlight in the process of making food by plants. Students are presented with plants that they watch over time in various conditions, with individual groups selecting different variables. The data from the experiments will give students the opportunity to describe the pattern of the role that each of these variables has on plant growth. (*Formal Assessment: Conditions for Plant Growth, pp. 12-13*)

SIPS Grade 5 Unit 1 EOU Assessment Task 3: Change or Not?

Prompt 1 Parts A and B

Performance Category: Use Observations and Measurements of Chemical Reactions

Acquisition Goals:

- **A12.** Describe how properties of matter can be used to compare and contrast materials and describe the outcomes of combining substances.
- **A17.** Construct an explanation by comparing properties to determine whether mixing two or more substances results in a new substance.

Prompt 1 measures students' ability to:

- Use observations and measurements as evidence to describe how changes in observed and measured properties of two substances before and after mixing indicates a new substance is formed.

Student Worksheet

This task is about the results of mixing materials.

Task

Mr. Carter and his students design an investigation to determine if mixing different substances can result in a new substance. The students ask if the total mass of the combined substances will stay the same if a new substance is formed. Mr. Carter says, "Great question! Let's investigate to find out what happens."

Prompt 1

Mr. Carter has a solution of water and soda ash in Jar A and a solution of water and Epsom salt in Jar B. Mr. Carter slowly combines the solutions from Jar A and Jar B into Jar C.

Table 1 shows the students' record of their observations.

Table 1. Record of Observations

Solution in Jar A	Solution in Jar B	Solution in Jar C
After mixing the soda ash and water, the solution is clear.	After mixing the Epsom salt and water, the solution is clear.	After mixing the two clear solutions together, a white solid is seen on the bottom of the jar.

Part A.

Did mixing the two solutions together cause a new substance to be formed? Circle your answer.

A new substance IS formed.

A new substance IS NOT formed.

Part B.

Use **Table 1** showing the students' observations of Jar A, Jar B, and Jar C to support your answer to **Part A**.

The solutions in Jar A and in Jar B were clear. After the solutions were combined, a solid, white substance formed in Jar C. This must be a new substance because the other solutions were clear.

Task 3 Prompt 1 Parts A and B Complexity		
Degree and Nature of Sensemaking	Moderate	This prompt... Requires integration of two dimensions in the service of sense-making
Complexity of the Presentation	Moderate	- The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts - Provides graphics/data/models
Cognitive Demand of Response Development	Moderate	- Requires drawing relationships and connecting ideas and practices - Requires a moderate level of sophistication with typical and relatively complex representation of ideas and application of skills
Cognitive Demand of Response Production	Moderate	Response includes one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

Task 3 Prompt 1 Parts A and B Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
Part A - Students read the informational text to identify if mixing the two substances together caused a new substance to be formed. - Students understand that when two or more different substances are mixed, a new substance with different properties may be formed. - Students use this information to decide if a change has occurred and a new substance has formed. Part B - Students use Table 1 to look at the properties of beginning substances and compare them to the properties of the final product and use this information to support their answer in Part A.	
Formative Assessments	Opportunities to Learn
Segment 3, p. 17 <i>Formal Assessment: Messin' with Mixtures (A12, A17)</i> - Students accurately compare and contrast properties of matter before and after combining substances. - Students accurately identify and/or describe the evidence that supports a claim about whether or not mixing two substances results in a new substance.	Segment 2, p. 29 <i>What is This? (A12)</i> Students engage in a class discussion of the different types of properties that can be used to describe substances, including both characteristic properties (e.g., solubility, flammability, odor, heat conductivity, magnetism) and non-characteristic properties (e.g., weight, volume).

Task 3 Prompt 1 Parts A and B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 3, pp. 17-18 <i>Formal Assessment: Why Did it Mooove? (A12)</i> - Students accurately compare and contrast properties of matter before and after combining substances. - Students draw appropriate conclusions from data about which properties of substances change after being mixed. - Students accurately describe which properties of a substance are changed and how they are changed after being mixed. Segment 4, pp. 19-20 <i>Formal Assessment: How Did the Balloon Fill? (A17)</i> - Students accurately compare and contrast properties of matter before and after combining substances. - Students accurately identify and/or describe the evidence that supports a claim about whether or not mixing two substances results in a new substance.	Segment 2, pp. 29-30 <i>Investigating the Mystery Matter (A12)</i> - Students use properties of substances to determine if substances are the same or different before and after mixing. Segment 4, pp. 33-34 <i>Where Did it Go? (A12, A17)</i> - To introduce the idea of mixing and chemical changes, the teacher mixes baking soda (base) and vinegar/lemon juice (acid). The class measures the mass of the acid, base, and container before the reaction. The class discusses the physical characteristics of these items using physical characteristics of these two reactants. Segment 4, p. 34 <i>What Happened? (A12, A17)</i> - Students obtain information from curated resources that help explain how to determine if a new substance was formed using properties of the substance(s) before and after.

Task 3 Prompt 1 Parts A and B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 4, p. 20 <i>Formal Assessment: Physical Change or Chemical Change? (A12)</i> - Students accurately compare and contrast properties of matter before and after combining substances. - Students accurately identify and/or describe the evidence that supports a claim about whether or not mixing two substances results in a new substance. Segment 4, pp. 20-21 <i>Formal Assessment: What Happened in the Anchoring Phenomenon (A17)</i> - Students construct an appropriate explanation and identify the evidence to support a claim about whether or not mixing two substances results in a new substance. - Students accurately identify and/or describe properties of matter after combining substances. - Students accurately compare and contrast properties of matter before and after combining substances.	Segment 4, p. 35 <i>What Went Right? (A12, A17)</i> Students go through a recipe to connect the learning experiences from the unit to the steps, highlighting examples of mixtures, solutions, physical and chemical changes, changes of state, and the interaction of particles.

Prompt 2 Parts A and B

Performance Categories: Use Observations and Measurements of Chemical Reactions

Acquisition Goals:

- **A9.** Measure and graph weights to produce data that shows that the total weight of substances when heating, cooling, or before or after they are mixed is equal to the total weight of the substance(s) that are formed after they are mixed when a new substance doesn't form.
- **A18.** Analyze and interpret data to identify the pattern that the total weight of substances before they are mixed is equal to the total weight of the substance(s) that are formed after they are mixed.

Prompt 2 Parts A and B measure students' ability to:

- Use observations and measurements as evidence to describe how the total amount of matter is conserved no matter what reaction or change in properties occurs.

Prompt 2

In Table 2 and Table 3, Mr. Carter writes the mass, in grams, of the materials in Jar A and Jar B on the board.

Table 2.

Mass of Solution in Jar A

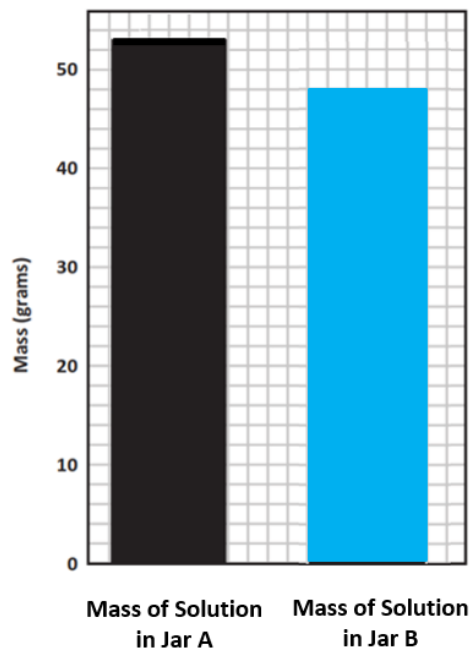
Substance	Mass (in g)
Water	40
Soda ash	13

Table 3.

Mass of Solution in Jar B

Substance	Mass (in g)
Water	40
Epsom salt	8

Graph 1. Mass of the Solution in Jar A and the Mass of the Solution in Jar B



Part B.

Mr. Carter tells the students that the total mass of the combined solutions in Jar C is 101 grams. Then, Mr. Carter writes the following sentence on the board:

When a new substance is formed by mixing different materials, the total mass of the new substance is equal to the combined masses of the original materials.

Do you agree with Mr. Carter's description of the results of the investigation?

Circle your answer. **YES** NO

Use the information from **Graph 1** and the total mass of **Jar C** to support your answer to **Part B**.

Graph 1 shows **the total weight of solution A and solution B adds up to 101 grams.**

The total mass of the solution of Jar C is **101 grams.**

So, when the solutions were mixed and a change occurred, **the total mass of the new substance is equal to the combined masses of the original materials which is 101 grams.**

Task 3 Prompt 2 Parts A and B Complexity		
Degree and Nature of Sensemaking	High	This prompt... Requires integration of three dimensions in the service of sense-making
Complexity of the Presentation	Moderate	- The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts - Provides graphics/data/models
Cognitive Demand of Response Development	Moderate	- Requires drawing relationships and connecting ideas and practices - Requires a moderate level of sophistication with typical and relatively complex representation of ideas and application of skills
Cognitive Demand of Response Production	High	Responses include multiple paragraphs, multiple graphics of at least moderate complexity, or multiple steps in a complex process

Task 3 Prompt 2 Parts A and B Connections to the Instructional Framework	
Integration of Knowledge and Skills for Response Development	
Part A - Students observe the data in Tables 2 and 3. - Students use the data to reveal patterns that suggest relationships, such as that no matter what reaction or change in properties occurs, the total weight of the substances does not change. - Students use the data in Table 3 to complete Graph 1 to show the total mass of the solution in Jar B. Part B - Students read the statement and decide if they agree or disagree with the statement using information from Graph 1 and Jar C. - Students describe that mass is conserved or remains the same after mixing.	
Formative Assessments	Opportunities to Learn
Segment 3, pp. 16-17 <i>Formal Assessment: Weight of Water (A9)</i> - Students generate accurate graphs of data on the properties of a substance before and after a physical change. - Students measure and graph the weight of water in different phases.	Segment 3, p. 31 <i>Weight of Water (A9, A18)</i> Students focus more specifically on the weight of a substance to determine that when substances are physically mixed, heated, or cooled, the total weight does not change.

Task 3 Prompt 2 Parts A and B Connections to the Instructional Framework, Continued	
Formative Assessments	Opportunities to Learn
Segment 4, p. 20 <i>Formal Assessment: Physical Change or Chemical Change? (A18)</i> Students accurately compare and contrast properties of matter before and after combining substances.	Segment 3, pp. 32-33 <i>Messin' with Mixtures (A9, A18)</i> As students work through the investigation, they document the physical characteristics of the different materials as well as make measurements of the weight of the different elements individually and as a whole.

Future Learning Connected to evidence elicited in Task 3

Crosscutting Concepts

- In Unit 1, students focus on Cause & Effect and Scale, Proportion, and Quantity. Cause and Effect lies at the heart of science. Cause and Effect is also closely associated with the practice of “Engaging in Argument from Evidence.” In Unit 2, students will “Develop and use Models” of ecosystems and food webs to construct and support evidence-based “Arguments” that center around ecosystems. An understanding of Scale involves not only understanding systems and processes vary in size, time span, and energy, but also different mechanisms operate at different scales. The crosscutting concept of Scale, Proportion, and Quantity are essential considerations when deciding how to model a phenomenon and figures prominently in the practice of “Analyzing and Interpreting Data.” In Unit 2, students will explore the needs of plants, and use that data to refine their explanatory model to create scientifically accurate explanations. The Unit 1 Crosscutting Concepts serve as a starting point to make sense of phenomena explained in Unit 2, such as matter being transported into, out of, and within systems.

Disciplinary Core Ideas

- In Unit 1, students learn that matter is conserved when it changes form, that if a change in properties occurs, the total weight of the substances does not change, and that when two or more substances are mixed, a new substance is formed. This will help students build future understanding in Unit 2 that matter cycles between air and soil and among plants, animals, and microbes as organisms live and die and that organisms obtain gases and water from the environment and release waste matter back into the environment. In Unit 2, Acquisition Goal 12 requires students to develop a model to describe how matter cycles among living and non-living components within an ecosystem. Students are given a variety of biotic and abiotic (living and nonliving) picture cards and create a model of how matter moves through an ecosystem. (*Formal Assessment: Movement of Matter Through an Ecosystem: Can You Show It?*, pp. 14-15)

Science and Engineering Practices

- In Unit 1, students conduct investigations to collect data that can be used as evidence for their claims and use mathematical and computational thinking. These experiences working with models, data, and evidence help prepare them for engaging in an argument that makes use of these three forms of scientific information. In Unit 2, Acquisition Goal 8 requires students to plan or carry out an investigation on the role of air and water in plant growth. Students are presented with plants that they watch over time in various conditions, with individual groups selecting different variables. The data from the experiments will give students the opportunity to describe the pattern of the role that each of these variables has on plant growth. (*Formal Assessment: Conditions for Plant Growth*, pp. 12-13)