



# **Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project**

**Grade 5 Science**

**Unit 1 Instructionally-embedded Assessment Task:**

**“Weight of Water”**

**Structure and Properties of Matter**

**June 2023**

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## SIPS Grade 5 Unit 1 Instructionally-embedded Assessment Task

Grade 5	Unit 1	Instructional Segment 3	Task Title: Weight of Water
<b>NGSS Performance Expectations Code(s) and Description(s)</b>			
<b>Code</b>	<b>Description</b>		
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.]		
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.]		
<b>Acquisition Goals Number(s) and Descriptions(s)</b>			
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.		
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.		
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).*		
A11.	Make observations and measurements to produce data that shows the weight of a substance before and after a physical change remains unchanged.		
<b>Evidence Statements</b>			
<ul style="list-style-type: none"> <li>• Accurately identify and/or describe how an instrument can be used to determine the properties of substances.</li> <li>• Accurately describe the procedure for an investigation to determine the properties of a substance.</li> <li>• Make appropriate observations and/or measurements to produce data that will help determine the properties of a substance.</li> <li>• Generate accurate graphs of data on the properties of a substance before and after a physical change.</li> </ul>			

<ul style="list-style-type: none"> <li>• Measure and graph the weight of water in different phases.</li> <li>• Describe the changes that occur when a substance changes states.</li> <li>• Accurately describe changes (and/or what stays the same) in observed properties after a physical change.</li> </ul>												
<b>Source Documentation and Information Resources References (e.g., publications, websites, citations, images, videos, etc.)</b> Please include source name, description, citation, and a link to its original location below. Include additional rows as needed.					<b>Licensing:</b> Please mark an “X” under the appropriate licensing. If resource is not under a creative commons (CC) license, please attempt to find a source with CC licensing. If you are unable, please select other and provide additional information about the source in the source documentation section.							
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## Teacher Administration Guide

### Introduction

- Educators developed the accompanying classroom task to align to one or more aspects of the NGSS Performance Expectation(s) (PEs) to determine where students are in their learning at a specific point in time during an instructional sequence. Educators will need to make intentional decisions about when and how to use this task based on their students' learning needs, the purpose of giving the task, and the intended use of the evidence gathered.
- This task is designed to measure students' ability to integrate the dimensions and demonstrate their knowledge, skills, and abilities as represented by NGSS Performance Expectation **5-PS1-2** and **5-PS1-3**. By administering this task, educators can gather and evaluate evidence to make accurate and meaningful judgments about students' science learning and determine how instruction may need to be adjusted along an instructional sequence to best support students.
- The phenomenon in this task involves an investigation into how substances can change physically, such as in their shape or number of pieces, while staying in the same state or not, and whether the amount (weight) of matter is conserved.
- In this task, students apply their understanding that solids, liquids, and gases are forms of matter and have mass/weight and engage with investigation and graphing to support claims that properties and/or weights do or do not change when a substance changes state or two substances are mixed. Students will use data to show that the total amount of matter was conserved during the change and the properties of water are changed when mixed with salt.
- **Background information:**
  - Students previously discovered that (1) the particles of a substance in multiple quantities are the same and made up of particles that are too small to be seen and (2) a variety of properties can be used to identify materials.
  - In this assessment, students will be presented with a scenario related to a science class in which they are investigating the properties of water and how the amount of matter (mass/weight) is conserved during physical changes.

### Administration Guidelines

- One (1) class period
- Segment 3 Lesson: "Weight of Water"
- Students individually complete a series of prompts reflecting the following chain of sensemaking:
  - Students determine the tools to be used to measure and describe physical quantities, such as mass/weight and volume.
  - Students describe the procedure and what quantities to measure to investigate the conservation of matter during a change in state from liquid to solid.
  - Students describe the physical change when a liquid becomes a solid.
  - Students use data to show that the total amount of matter (water) is conserved during a change in state from liquid to solid.
  - Students use data to show that the total amount of matter is conserved when mixing two different substances.

- Students graph data to explain how observations and measurements are useful for identifying the change to the properties of one substance when mixed with another.
- Students recognize that materials can be identified based on their observable and measurable properties.

### **Accessibility Considerations**

Providing a range of accessibility considerations in the task (e.g., multiple ways of representing information, multiple types of supports, multiple ways in which students respond) promotes equity and fairness across a wide range of students who may be at different points in their science learning. In turn, these considerations can promote student interest and engagement in the tasks resulting in a more complete and accurate collection of evidence of students' science learning.

Accommodations for students with a disability or Multilingual Learners that are part of their on-going instructional programs are to be provided during the administration of this task. Accommodations should be consistent with those provided student's daily instructional strategies and assessment opportunities including assistive technology devices if appropriate. These accessibility considerations and accommodations enable accurate inferences about student learning and inform meaningful adjustments to planning and instruction.

### **Ancillary Materials**

- None

### **Instructions for Administering the Performance Task or Implementing the Research Task, Design Project, or Lab**

- Pose the scenario: Investigating structure and properties of matter.
- Students will explore how the amount of matter (mass/weight) is conserved during physical changes.

### **Scoring Guidance**

- A task-and prompt-specific scoring rubric indicates scoring criteria for each prompt across a range of score points.
- Student exemplars represent high-quality responses that align to full-point rubric scores. The exemplar responses are intended to assist educators' understanding of the nature and expectations of each prompt when applying the scoring rubric. Note the exemplars serve as examples of high-quality responses, and students may respond with equally relevant, scientifically accurate responses and ideas that meet the expectations of a full-point rubric score. In general, the exemplar response associated with the highest score point in the rubric meets expectations and is scientifically accurate, complete, coherent, and consistent with the type of student evidence expected as described in the rubric.
- The approximate scoring time for this task will be 5 to 10 minutes per student.

## Student Task

This task is about physical changes and the weights of substances before and after a change.

### Task Scenario

Students in a science class are planning an investigation of the properties of water when it changes state. The students consider what physical properties they should measure. They consider how they should set up the investigation. They discuss what they should observe and record to understand the physical properties of water before and after a physical change.

### Prompt 1

The students use Table 1 to identify the physical properties of water they can measure before and after a physical change.

### Part A.

Identify the physical property of water, the tool or method, and the measurement units to be used to measure before and after a physical change in **Table 1**. The first row is complete.

**Table 1. Physical Properties of Water to Measure Before and After Change**

Physical Property	Tool or Method	Units
Temperature	thermometer	Degrees (°F or °C)

**Part B.**

The students' science teacher gives them a question to answer by completing the investigation.

**Does the weight of liquid water change when it is frozen?**

Describe a method the students could use to collect the data needed to answer the question. Include **three (3)** steps to follow and which tool would be used for each step from **Table 1**.

**Step 1.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Step 2.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Step 3.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Prompt 2*

The students collect data to answer the question, "Does the weight of liquid water change when it is frozen?"

- First, they record the weight of an empty glass.
- Then, they pour one cup of room temperature water into the empty glass.
- Next, they determine that one cup of water weighs approximately 237 g by subtracting the weight of the empty glass.
- Finally, they measure the weight of the glass of water in the freezer every 30 minutes.

The students record their estimate of how much of the water is frozen each time the cup is weighed until it appears to be 100% frozen into ice.

The results are shown in Table 2.

**Table 2. Student Data on Freezing Water**

<b>Time Spent in Freezer (minutes)</b>	<b>Percent Frozen (% estimate)</b>	<b>Weight (grams)</b>
0	0	237
30	25	237
60	50	237
90	75	237
120	100	237

Answer the question, “Does the weight of liquid water change when it is frozen?” Circle your response.

**YES**

**NO**

Use data from **Table 2** to support your answer.

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**Prompt 3**

The students decide to set up an investigation to learn what happens to the total weight of **different** substances when they are combined. They compare the weight of tap water to the weight of a mixture of salt and tap water. They know that salt dissolves in water.

The materials for the investigation are:

- Two (2) glasses, each filled with one (1) cup of tap water
- One (1) teaspoon of salt

The students record the data in Table 3.



**Table 3. Student Data on Tap and Salt Water**

Substance	Weight (grams)
Salt	6
Tap water	237
Salt and water solution	243

**Part A.**

Does the total weight of the salt and tap water change or stay the same after mixing? Circle your answer.

**The total weight changes.**

**The total weight stays the same.**

Use information from **Table 3** to support your answer to **Part A**.

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**Part B.**

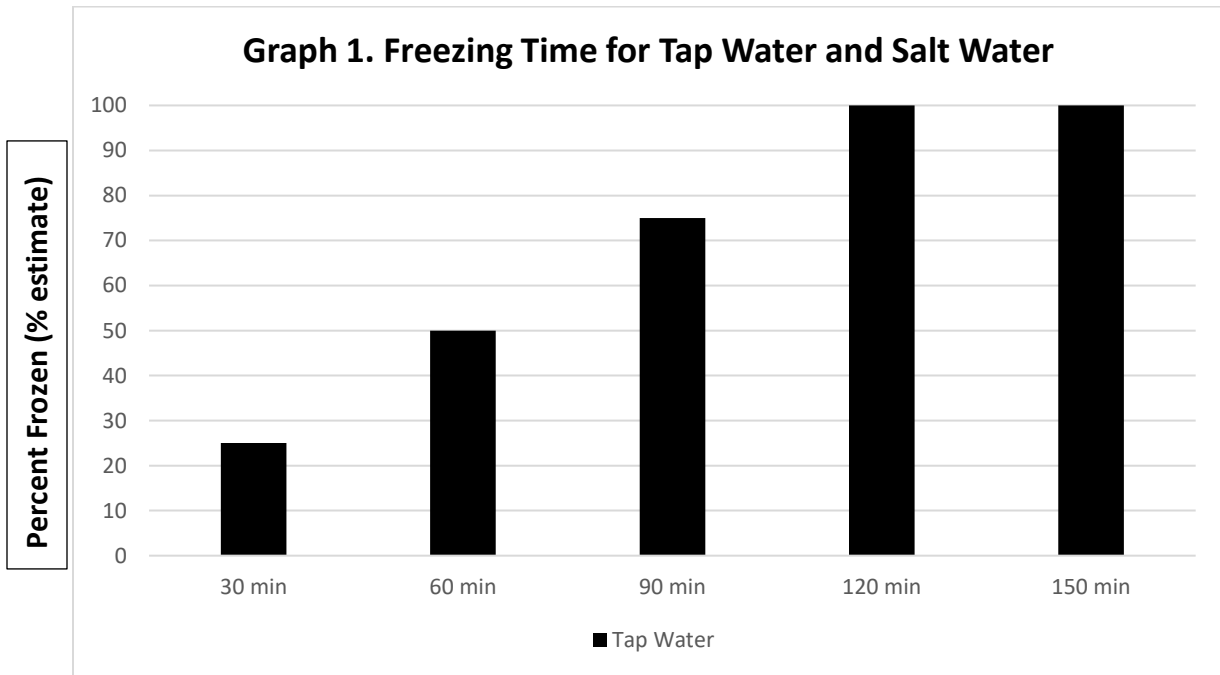
The students observe both the tap water and the tap water with salt are clear. The students want to find out if adding salt to tap water affects other properties of tap water. They decide to repeat the investigation of freezing using the salt and water mixture.

The results are shown in Table 4.

**Table 4. Student Data on Freezing Salt Water**

Time Spent in Freezer (minutes)	Percent Frozen (% estimate)	Weight (grams)
0	0	243
30	20	243
60	40	243
90	60	243
120	80	243
150	100	243

**Graph 1** shows the freezing times for tap water using the data in **Table 2**. Add the freezing times for the mixture of salt and tap water from **Table 4** to the graph. Place unshaded bars to represent the estimated percent frozen data for salt water to the right of the data for tap water shown by shaded bars.



**Part C.**

Does adding salt change any of the properties of tap water?

Circle your answer.

**YES**

**NO**

Use information from **Graph 1** to support your answer to **Part C**.

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## Task Rubric to Evaluate Student Evidence

Task	Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
<b>Prompt 1 Part A.</b>	No aspect of the response is correct	Response includes the following aspects: <ul style="list-style-type: none"> <li>• 2-3 physical properties</li> <li>• At least 1 tool related to a physical property to be measured</li> <li>• At least 1 of the units is related to the measurement tool</li> </ul>	Response includes the following aspects: <ul style="list-style-type: none"> <li>• 2-3 physical properties</li> <li>• 2-3 tools related to the physical property to be measured</li> <li>• Correct units related to each of the measurement tools</li> </ul>	Response includes the following aspects: <ul style="list-style-type: none"> <li>• 4 physical properties</li> <li>• 4 tools related to the physical property to be measured</li> <li>• Correct units related to each of the measurement tools</li> </ul>	Response includes the following aspects: <ul style="list-style-type: none"> <li>• 5 physical properties</li> <li>• 5 tools related to the physical property to be measured</li> <li>• Correct units related to each of the measurement tools</li> </ul>
<b>Prompt 1 Part B.</b>	No aspect of the response is correct	Response includes <b>one (1)</b> of the <b>three (3)</b> aspects	Response includes <b>two (2)</b> of the <b>three (3)</b> aspects	Response includes the following aspects: <ul style="list-style-type: none"> <li>• Three (3) steps in a logical sequence</li> <li>• Steps include the tool(s) to use to record specific measurements</li> <li>• A comparison of before and after weights</li> </ul>	NA
<b>Prompt 2</b>	No aspect of the response is correct	Response includes <b>one (1)</b> of the <b>two (2)</b> aspects	Response includes the following aspects: <ul style="list-style-type: none"> <li>• Circles “NO”</li> </ul>	NA	NA

			<ul style="list-style-type: none"> <li>• Uses data to support their answer (e.g., mass/weight of water is conserved during a physical change)</li> </ul>		
<b>Prompt 3 Part A.</b>	No aspect of the response is correct	Response includes <b>one (1)</b> of the <b>two (2)</b> aspects	<p>Response includes the following aspects:</p> <ul style="list-style-type: none"> <li>• Circles “The total weight stays the same”</li> <li>• Describes the combined weight of the salt and water as 6 grams plus 237 grams (or as 243 g) and the total weight of the solution as 243 grams</li> </ul>	NA	NA
<b>Prompt 3 Part B. and Part C.</b>	No aspect of the response is correct	Response includes <b>one (1)</b> of the <b>four (4)</b> aspects	Response includes <b>two (2)</b> of the <b>four (4)</b> aspects	Response includes <b>three (3)</b> of the <b>four (4)</b> aspects	<p>Response includes the following aspects:</p> <p><b>Part B</b></p> <ul style="list-style-type: none"> <li>• Completes bar graph to show the estimated percent frozen data for salt water</li> </ul> <p><b>Part C</b></p> <ul style="list-style-type: none"> <li>• Circles “YES”</li> <li>• Concludes that salt water has a lower</li> </ul>

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freezing point than  
freshwater

- Explains how the data supports the conclusion
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**Exemplar Responses**

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**Prompt 1****Part A.**

Identify the physical property of water, the tool or method, and the measurement units to be used to measure before and after a physical change in **Table 1**. The first row is complete.

*Table 1. Physical Properties of Water to Measure Before and After Change*

Physical Property	Tool or Method	Units
Temperature	thermometer	Degrees (°F or °C)
Weight	Balance, electronic scale, etc.	grams or ounces
Volume	Cup, beaker, etc.	Ounces, milliliters
Time	Clock, stopwatch, etc.	Hours, minutes
Size	Ruler, tape measure	Inches, centimeters
Shape	Visual observation	none

Note: Table 1 is not an exhaustive list. Other plausible properties, tools, and units may be included.

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**Prompt 1****Part B.**

Describe a method the students should use to collect the data needed to answer the question. Include **three (3)** steps to follow and which tool would be used for each step from **Table 1**.

**Step 1.** Measure the weight of one cup of liquid water. Take the temperature of the water.

**Step 2.** Place the cup of water into the freezer until it is frozen. Take the temperature inside the freezer.

**Step 3.** Measure the weight of one cup of frozen water and compare the before and after weights.

Note: The exemplar steps are not exclusive. Other plausible steps may be described. Note that the steps should be in an appropriate order and may not address all of the steps necessary to complete the investigation.

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**Prompt 2**

Answer the question, “Does freezing change the weight of water?” Circle your response.

YES

NO

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Use data from **Table 2** to support your answer.

The weight of the water in the glass stayed at 237 grams when it was liquid and when it was ice.

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**Prompt 3**

**Part A.**

Does the total weight of the salt and tap water change or stay the same after mixing?

Circle your answer.

*The total weight changes.*

*The total weight stays the same.*

Use the information from **Table 3** to support your answer to **Part A**.

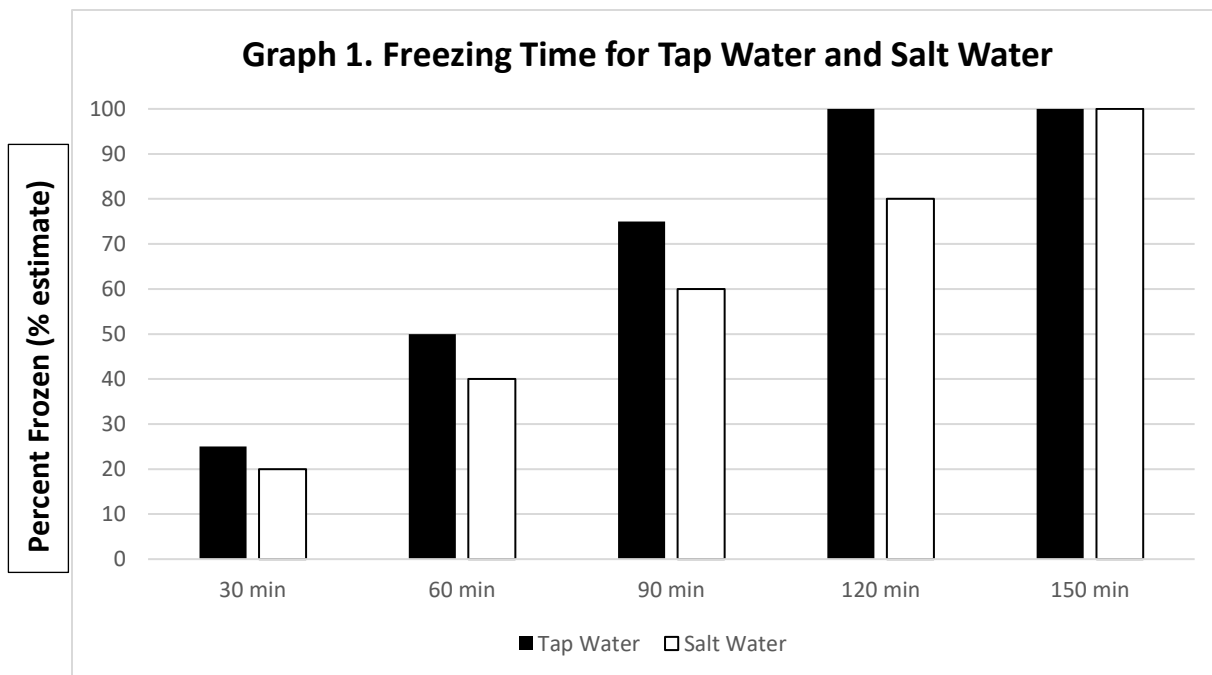
The weight of the salt is 6 grams. The weight of one cup of water is 237 grams. The total weight of the two substances mixed together is 243 grams. That means the weight of the solution is the same as the two substances combined.

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**Prompt 3**

**Part B.**

**Graph 1** shows the freezing times for tap water using the data in **Table 2**. Add the freezing times for the mixture of salt and tap water from **Table 4** to the graph. Place unshaded bars to represent the estimated percent frozen data for salt water to the right of the data for tap water shown by shaded bars.





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**Prompt 3**

**Part C.**

Does adding salt change any of the properties of tap water?

Circle your answer.

YES

NO

Use information from **Graph 1** to support your answer.

The data shows that adding salt to tap water makes the water take longer to freeze. When the water with salt is about 80% frozen after 120 minutes, the tap water is already about 100% frozen. So, adding salt changes the properties of tap water.

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**Task Notes:**

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