

Investigation Three – Melting and Freezing (Physical Change)

Standard I Students will understand that chemical and physical changes occur in matter.
Objective 1 Describe that matter is neither created nor destroyed even though it may undergo change.
Objective 2 Evaluate evidence that indicates a physical change has occurred.
Intended Learning Outcomes <ol style="list-style-type: none">1. Use science process and thinking skills2. Manifest scientific attitudes and interests3. Understand science concepts and principles4. Communicate effectively using science language and reasoning

Standard I

Objective 1
Objective 2

Background Information

Your students may know that ice will float on water, but they may not know that any volume of water has the same weight whether it is frozen or liquid.

Pre-Assessment/Invitation to Learn

This demonstration will help to grab your students' attention and introduce the activity. To prepare, fill a plastic locking bag with ice cubes. Leave it in a freezer until you are ready to do the demonstration. Fill another plastic locking bag with the same amount of water as you did the ice tray and zip it closed.

Make a T-chart or Venn Diagram on the board and have the students list the properties of the ice on one side and the water on the other side. Remind students that weight is a property of matter. Ask: "If I took a bag of water and froze it, would it weigh more before it was frozen or after it was frozen?" Listen to their answers and explain that today they are going to do an experiment to discover the correct answer to that question.

Instructional Procedure

Cooperative teams of 3-5 should complete the following procedures. Each student should write their observations in their journals.

1. Using a permanent marker, label a plastic locking bag with your team identification.
2. Measure 250 ml of water using a measuring cup. Pour the water into the plastic locking bag and seal the bag.
3. Weigh the bag and the water and record the weight.

Materials

- Ice
- Water
- Zip-lock bags

- Materials**
For each team
- Zip-lock bag
 - Scale
 - Access to a freezer
 - Measuring cups
 - Permanent marker
 - Water

4. Place the bag of water in a freezer.
5. Record a prediction of what you think the weight of the water and bag will be after the water was frozen.
6. Weigh the bag after the water is completely frozen. Record the weight and compare the frozen weight with the liquid weight.
7. Write a statement that explains the relationship of the weight of water and ice.
8. Write a hypothesis of what the weight of the water will be when it melts. Let the water melt and check your prediction.
9. After students have completed the activity allow them to share what they have learned.

Curriculum Extensions

Science –

After students have discovered that a specified quantity of water has the same weight, whether frozen or solid, challenge the teams to design an experiment to learn if the same is true for other types of matter. Have the students think of common things that melt and freeze at temperatures that can safely be attained in the classroom. (*Many items can be safely melted in the classroom by placing them in a Mason Jar then placing the jar in a pan of water and heating the water on a hot plate. Or, try placing the items on aluminum foil under an adjustable desk lamp.*) These items might include chocolate, butter, ice cream, wax, cooking oil, or shortening.

- Have each team select a different substance to test and write step-by-step procedures for conducting the experiment. Allow teams to share their data after completing the experiment. Work with each team to ensure that safety concerns are addressed while melting and freezing the substances, and that neat and accurate data is collected. (*ILOs 1, 4*)

Assessment Suggestions

- Discuss the statement: The weight of a specified quantity of water (liquid) is equal to the weight of the same quantity of ice (solid). Is this statement always true? Is freezing a physical change or a chemical reaction? Why? (*No new substance is created; the water just goes through a physical change.*) Is this statement true for all forms of matter? How would you test other types of matter?
- Check for accuracy of students' observations in their journals.

Reference to Assessment Section:

Unit Test	Multiple Choice	Constructed Response	Performance Test
1	1, 2, 4, 5	2	
2	1, 2, 5, 6	1	