

States of Matter

Grade 5, Understanding Matter & Energy

<h2 style="margin: 0;">Lesson Plan</h2>	Assessment	Experiment
	Cross-curricular	Language

Big Ideas

- There are three states of matter.
- Physical change refers to the fact that a substance can be changed from one form to another.

Overall Expectations

- Conduct investigations that explore the properties of matter and changes in matter;
- Demonstrate an understanding of the properties of matter, changes of state, and physical and chemical change

Specific Expectations

- 2.1** follow established safety procedures for working with heating appliances and hot materials;
- 2.2** measure temperature and mass, using appropriate instruments;
- 2.3** use scientific inquiry/experimentation skills to investigate changes of state and changes in matter;
- 3.3** explain changes of state in matter (e.g., evaporation, condensation, solidification or freezing, fusion or melting, sublimation), and give examples of each;
- 3.4** describe physical changes in matter as changes that are reversible;
- 3.5** describe chemical changes in matter as changes that are irreversible;
- 3.6** explain how changes of state involve the release of heat or the absorption of heat;
- 3.8** distinguish between a physical change and a chemical change, whereas a chemical change creates new substance(s).

Description

We've all seen water at its 3 states of matter: Steam from a boiling kettle; Water in a glass; and Ice cubes. In this activity, students will investigate the freezing, melting, and boiling points of different substances and determine what differences and similarities may exist.

Materials

Student Observation Handout
 Thermometer
 Hot Plate
 Gloves
 Goggles
 Homemade "Freezer" – Ice, Salt, Ziploc Bags

Possible substances you can use:

Water, vegetable oil, milk, orange or apple juice, pop, soapy water, water and salt solution, water and sugar solution, vinegar.

Safety Notes

Please ensure that students are wearing appropriate safety equipment such as gloves and goggles when they are using hot plates. Also, please remind students that hot plates are not left unattended but rather plugged out immediately after use. Students are also to be cautious when touching any substances that have been heated or cooled as they may result in injury to the skin by being too cold or hot.

Introduction

Ask students what they know about the different states of water. Hopefully students can identify that they have seen water in each of the 3 states and they may be able to tell you something about the specific temperatures at which the changes may occur. You may wish to do a demonstration of liquid water being boiled and turning into vapour and demonstrating how you may go about determining the temperature. It would be important for students to also understand the following terminology as they identify the changes in state - evaporation, condensation, solidification or freezing, fusion or melting, and sublimation. In order to do this, you may ask, what change of state happens during condensation? During solidification? Once finished, invite students to consider different liquids they may wish to investigate in order to determine what their freezing/melting and boiling points may be.

Action

Generate inquiry questions based on Q-Chart. Possible questions can include:

- Why might adding sugar or salt to water change the melting, freezing or boiling points of water?
- Why might different substances have different melting, freezing or boiling points?
- How can we determine the melting, freezing or boiling point of a specific substance?
- How will the make-up of different substances change the melting, freezing, or boiling points of substances?
- How can we identify the points at which a substance is melting, freezing and/or boiling?

Once students have identified the focus of their inquiry. Have them make a hypothesis and if time permits, research so that they have an idea of what may already exist. Have students record their hypothesis on their student observation sheet and have them also state why they are making their hypothesis.

Students will then safely use the hot plates to heat their substances and create a freezer - using a Ziploc bag with ice and salt inside - to freeze their substances. When trying to identify the boiling point, students should look for the formation of bubbles in the liquid. When trying to identify the melting/freezing point, students should look for a thickening of the substance and the formation of solids within the liquid. Students should consider using half the volume of the liquid to determine the melting/freezing point and the other half of the liquid to determine the boiling point.

Consolidation/Extension

Discuss results with students and have them share their observations possibly in a gallery walk or by having them do a simple oral presentation based on the extent of their inquiry. Students may wish to also research other materials and try to determine factors associated with high or low, melting, freezing and boiling points.