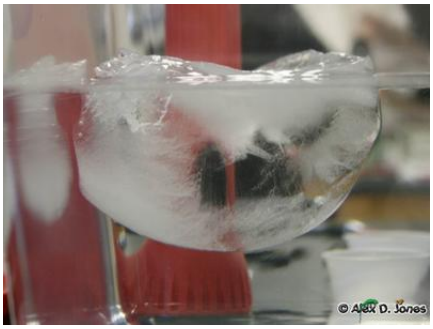
Ice

Physical Science | Lesson Guide

2nd Grade

Photo Description



A clear glass bowl holds water with ice cubes floating on top. White fog or mist comes from the water. The ice looks cloudy and bumpy, not smooth like regular ice cubes.

Scientific Phenomena

This image shows sublimation - the process where solid matter (likely dry ice) changes directly into gas without becoming liquid first. The white "fog" or mist visible above the water is actually tiny water droplets forming when the extremely cold carbon dioxide gas from sublimating dry ice meets the warmer, humid air. This creates a dramatic cooling effect that causes water vapor in the air to condense into visible droplets, creating the misty appearance.

Core Science Concepts

1. States of Matter: Matter exists in different forms - solid, liquid, and gas - and can change from one state to another
2. Temperature Effects: Very cold substances can make the air around them cold enough to create visible water droplets
3. Sublimation: Some solids can turn directly into gas without melting into liquid first
4. Condensation: When warm air meets something very cold, tiny water droplets form in the air

Pedagogical Tip:

Use concrete, hands-on experiences with regular ice cubes first to help students understand basic state changes before introducing the more complex concept of sublimation. Let them observe ice melting in warm water as a foundation.

UDL Suggestions:

Provide multiple ways for students to observe and record changes: drawing pictures, using gesture to show state changes, and verbal descriptions. Consider students who may have visual impairments by describing the sounds (bubbling, fizzing) and safe tactile experiences (feeling cool air from a distance).

Zoom In / Zoom Out

1. Zoom In: At the molecular level, the solid particles are gaining energy and breaking free from their rigid structure, moving so fast they skip the liquid phase entirely and become gas molecules that spread out rapidly.

2. Zoom Out: This same process happens in nature when snow and ice disappear on cold, dry days without melting, and in industrial applications like freeze-drying food or creating special effects in theater and movies.

Discussion Questions

1. What do you notice happening to the ice in the water? (Bloom's: Observe | DOK: 1)
2. Why do you think fog appears above the water but not above regular ice? (Bloom's: Analyze | DOK: 2)
3. How is this different from what happens when you leave ice cubes in a cup? (Bloom's: Compare | DOK: 2)
4. What would happen if we put this bowl in a warmer or colder place? (Bloom's: Predict | DOK: 3)

Potential Student Misconceptions

1. Misconception: "The white fog is steam from hot water"
   Clarification: The fog forms because the air becomes very cold, not hot, causing water in the air to form tiny droplets we can see.

2. Misconception: "All ice melts the same way"
   Clarification: Regular ice melts into water, but some special kinds of ice (like dry ice) turn directly into gas.

3. Misconception: "You can't see air"
   Clarification: We can see water droplets that form in the air when it gets very cold very quickly.

Cross-Curricular Ideas

1. Math - Measurement & Observation: Have students measure the height of the fog or mist using non-standard units (like paper clips or blocks). Create a simple graph showing how the fog height changes over time as the dry ice continues to sublime.

2. ELA - Descriptive Writing: Ask students to draw and write about what they observe using sensory words. Encourage them to describe what they see (white mist), what they might feel (cold air), and what they hear (fizzing or bubbling sounds). Create a class word bank of descriptive words together.

3. Art - Color Mixing & Visual Effects: Have students paint or draw their own version of the fog and ice experiment using watercolors or chalk pastels to show how colors change when light passes through mist. Discuss how special effects artists use dry ice fog in theater productions and movies to create magical scenes.

4. Social Studies - Weather & Seasons: Connect this to real-world weather phenomena by discussing how snow and ice disappear on cold, sunny winter days without melting. Talk about how different places on Earth have different weather patterns that affect how water changes forms in nature.

STEM Career Connection

1. Materials Scientist: These scientists study different types of materials and how they behave, including how solids, liquids, and gases change. They might work with dry ice or other special materials to create new products. They work in laboratories, factories, and universities. Average Annual Salary: $65,000 - $95,000

2. Special Effects Technician: These professionals use science to create amazing visual effects for movies, theater shows, and concerts—including using dry ice to make fog and mist! They understand how temperature and states of matter work to create safe, spectacular displays. Average Annual Salary: $45,000 - $70,000

3. Climate and Weather Scientist: These scientists study how temperature affects water and weather patterns in our atmosphere. They observe how ice, water, and water vapor change forms, which helps them predict weather and understand climate patterns around the world. Average Annual Salary: $68,000 - $100,000

NGSS Connections

- Performance Expectation: 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
- Disciplinary Core Idea: 2-PS1.A Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature
- Crosscutting Concept: Patterns Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Sublimation: When a solid turns directly into a gas without becoming liquid first
* Condensation: When water vapor in the air turns into tiny water droplets we can see
* Temperature: How hot or cold something is
* State of matter: The form that matter takes - solid, liquid, or gas
* Vapor: Tiny particles of liquid floating in the air as gas

External Resources

Children's Books:
- What Is the World Made Of? All About Solids, Liquids, and Gases by Kathleen Weidner Zoehfeld
- Matter: See It, Touch It, Taste It, Smell It by Darlene Stille
- Solids, Liquids, and Gases by David Dreier