

Photo Description



A large, clear ice ball sits in a blue tray with water around it. The ice ball has a cloudy, white center with clear edges. You can see cracks and lines running through the ice that look like tiny lightning bolts frozen inside.

Scientific Phenomena

This image shows the anchoring phenomenon of ice formation and melting. The ice ball demonstrates how water changes from solid to liquid state when heat energy is added. The cloudy center occurs because air bubbles and impurities get trapped when water freezes quickly, while the clear outer layer formed more slowly. The cracks happen because ice expands as it warms and contracts as it cools, creating stress that causes the ice to fracture along weak points.

Core Science Concepts

1. States of Matter: Water exists in three states - solid (ice), liquid (water), and gas (water vapor). This ice ball shows the transition from solid to liquid state.
2. Heat Transfer: Thermal energy moves from the warmer air and water in the tray to the colder ice ball, causing it to melt from the outside in.
3. Physical Changes: Melting is a reversible physical change where the substance (water) stays the same, but its form changes from solid to liquid.
4. Expansion and Contraction: Materials expand when heated and contract when cooled, which explains the crack patterns visible in the ice.

Pedagogical Tip:

Start lessons about states of matter with hands-on observations like this ice ball. Having students draw and describe what they see before explaining the science helps them connect prior knowledge to new concepts.

UDL Suggestions:

Provide multiple ways for students to record observations - drawing, verbal descriptions, or using graphic organizers. Some students may better understand the concept through tactile exploration (safely touching the ice) rather than just visual observation.

Zoom In / Zoom Out

1. Zoom In: At the molecular level, water molecules in ice are locked in a rigid, hexagonal crystal structure. As heat energy increases, these molecules vibrate faster until they break free from the crystal structure and can flow freely as liquid water.

2. Zoom Out: This melting process connects to the larger water cycle on Earth. Ice melting in glaciers, lakes, and rivers contributes to water flow in watersheds, ocean currents, and weather patterns that affect climate around the world.

Discussion Questions

1. What do you think caused the cracks and lines you see in the ice ball? (Bloom's: Analyze | DOK: 2)
2. How might the melting process be different if we put this ice ball in a freezer instead of room temperature? (Bloom's: Apply | DOK: 2)
3. Why do you think the center of the ice ball looks cloudy while the edges look clear? (Bloom's: Evaluate | DOK: 3)
4. What other examples of melting and freezing do you observe in your daily life? (Bloom's: Remember | DOK: 1)

Potential Student Misconceptions

1. Misconception: "Ice is colder than water, so it makes things cold."
Reality: Ice isn't "cold" - it absorbs heat energy from warmer objects around it, making those objects feel cold.
2. Misconception: "The ice disappears when it melts."
Reality: The ice changes form but the same amount of water is still there, just in liquid form instead of solid.
3. Misconception: "All ice melts at the same speed."
Reality: Ice melts faster when there's more surface area exposed to heat, which is why this ball melts from outside to inside.

NGSS Connections

- Performance Expectation: 5-PS1-1 - Develop a model to describe that matter is made of particles too small to be seen
- Disciplinary Core Ideas:
 - 5-PS1.A - Matter and Its Interactions
 - 2-PS1.A - Matter and Its Interactions
- Crosscutting Concepts:
 - Patterns
 - Energy and Matter

Science Vocabulary

- * Melting: The process when a solid changes to a liquid by adding heat energy.
- * Physical change: A change in matter that doesn't create a new substance, like ice becoming water.
- * Heat transfer: The movement of thermal energy from a warmer object to a cooler object.
- * State of matter: The form that matter takes, such as solid, liquid, or gas.
- * Expansion: When matter gets bigger because its particles spread out when heated.
- * Molecules: Tiny particles that make up all matter, too small to see without special tools.

External Resources

Children's Books:

- The Magic School Bus: Wet All Over by Joanna Cole
- Water Is Water by Miranda Paul

- States of Matter by David Dreier

YouTube Videos:

- "States of Matter for Kids" - Simple explanation with animations of solid, liquid, and gas states (https://www.youtube.com/watch?v=ZnLbs_9pCbw)

- "Bill Nye the Science Guy: Phases of Matter" - Engaging demonstrations of how matter changes states (<https://www.youtube.com/watch?v=zy8Cm5VFVIQ>)