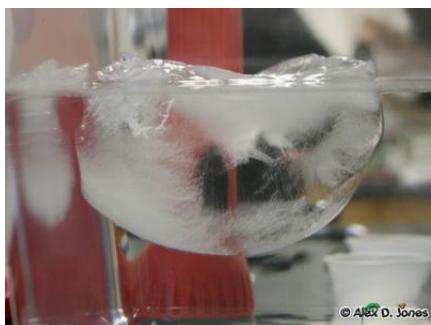


Photo Description



Scientific Phenomena

This image demonstrates phase transitions - specifically the melting of ice (solid water) into liquid water. The anchoring phenomenon is the change of matter from one state to another due to temperature differences. When ice is placed in warmer water or air, thermal energy transfers from the warmer environment to the colder ice, causing the water molecules in the ice to move faster and break free from their rigid crystal structure, transforming into liquid water.

Core Science Concepts

1. States of Matter: Water exists in three forms - solid (ice), liquid (water), and gas (water vapor/steam)
2. Phase Transitions: Matter can change from one state to another when energy is added or removed
3. Heat Transfer: Thermal energy moves from warmer objects to cooler objects until they reach the same temperature
4. Density and Buoyancy: Ice floats on water because solid water is less dense than liquid water

Pedagogical Tip:

Use the "Think-Pair-Share" strategy when introducing states of matter. Have students first think individually about examples of solids, liquids, and gases they know, then pair up to discuss, and finally share with the whole class. This builds confidence and activates prior knowledge.

UDL Suggestions:

Provide multiple ways for students to represent their understanding of states of matter - through drawings, physical demonstrations with their bodies (rigid for solid, flowing for liquid, bouncing for gas), or creating simple charts. This supports different learning preferences and abilities.

Zoom In / Zoom Out

1. Zoom In: At the molecular level, water molecules in ice are arranged in a rigid, hexagonal crystal structure held together by hydrogen bonds. As thermal energy increases, these molecules vibrate more rapidly until they break free from their fixed positions and begin to flow as liquid water.

2. Zoom Out: This melting process is part of Earth's water cycle, where ice in glaciers, polar ice caps, and seasonal snow melts to feed rivers, lakes, and oceans. This melting ice contributes to sea level changes and weather patterns across the planet.

Discussion Questions

1. What do you think will happen to the ice over time, and why? (Bloom's: Predict | DOK: 2)
2. How is the ice in this bowl similar to and different from ice you see outside in winter? (Bloom's: Compare | DOK: 2)
3. If you wanted to make the ice melt faster or slower, what could you do? (Bloom's: Apply | DOK: 3)
4. Why do you think ice floats on top of the water instead of sinking to the bottom? (Bloom's: Analyze | DOK: 3)

Potential Student Misconceptions

1. Misconception: "Ice melts because it gets tired of being cold."

Scientific Clarification: Ice melts because thermal energy from the environment causes water molecules to move faster and change from solid to liquid state.

2. Misconception: "The water disappears when ice melts."

Scientific Clarification: The water doesn't disappear - it changes form from solid ice to liquid water. The same amount of water is still there.

3. Misconception: "All solids sink in liquids."

Scientific Clarification: Ice floats on water because it is less dense than liquid water. Whether something floats or sinks depends on its density compared to the liquid.

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: PS1.A - Structure and Properties of Matter
- Disciplinary Core Ideas: PS3.B - Conservation of Energy and Energy Transfer
- Crosscutting Concepts: Energy and Matter
- Crosscutting Concepts: Cause and Effect

Science Vocabulary

- * Melting: The process when a solid changes into a liquid due to heat
- * Phase transition: When matter changes from one state to another state
- * Thermal energy: The energy that comes from heat and makes molecules move faster
- * Density: How tightly packed the molecules are in a material
- * Buoyancy: The ability of an object to float in a liquid
- * Water vapor: Water in its gas form that you can sometimes see as steam

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

- "Solid, Liquid, or Gas?" by Fiona Bayrock

YouTube Videos:

- "States of Matter for Kids" - Educational video explaining solids, liquids, and gases with simple experiments: <https://www.youtube.com/watch?v=uBTbxWQj3kQ>

- "Bill Nye the Science Guy: Phases of Matter" - Engaging explanation of how matter changes states: <https://www.youtube.com/watch?v=yz8E5n1Tzlo>