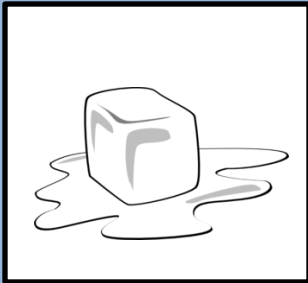


Keep it Cool: *Mastering Insulators*



- 🔹 **Grade Levels:** 6 - 8
 - 6th grade
SEEd 6.2.4
 - 8th grade
SEEd 8.1.7
- 🔹 **Duration:** 1.5 hours
- 🔹 **Skills:**
 - Observing
 - Measuring
 - Experimenting
 - Formulating Models

Introduction

Thermal insulators act as a buffer between an object and the outside environment. In this activity, students will create a thermal-insulating container and measure how effective it is at preventing the transfer of heat.

Phase 1: Building the Bottle

In Phase 1, students will create a thermal-insulating container that will protect an ice cube from a hot environment.

Time: 15 minutes

Materials: 2-liter bottles
1-liter bottles
Scissors
Packing tape
Insulating materials (shredded paper, packing peanuts, fabric pieces, grass, etc.)

Instructions:

- 🔹 Introduce the concept of thermal insulation.
- 🔹 Split class into groups of 3 to 5 students.
- 🔹 Give each group a 1-liter bottle, 2-liter bottle, and access to insulating materials.
- 🔹 Inform students they will be creating a thermal-insulating container using a 2-liter bottle and they need to leave enough room so a 1-liter bottle can easily fit inside.
- 🔹 Have each group cut their 2-liter bottle in half.
- 🔹 Have students use different insulating materials of their choice to create their container.
- 🔹 Stop here if you are splitting the activity into two days; otherwise, continue to Phase 2.

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Keep It Cool continued...



Phase 2: Applying Heat

In Phase 2, the thermal-insulating container will be put to the test.

- Time:** 45 minutes
- Materials:** A warm location or source of heat
Keep It Cool datasheet
Ice (a water-bottle ice cube tray is suggested)
Scale
Timer

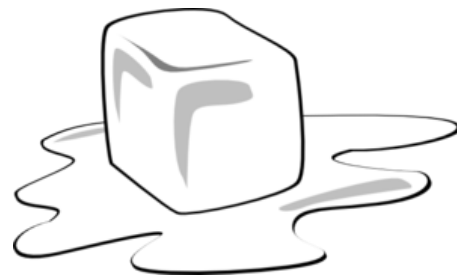
Instructions:

- Have groups weigh their 1-liter bottle and record the data.
- Give each group three ice cubes and have them quickly place it in their 1-liter bottle.
- Reweigh the 1-liter bottle with the ice and record the data.
- Instruct groups to put the 1-liter bottle inside their 2-liter bottle.
- Place the bottles in a warm location to expose them to heat.
- When at least 45 minutes has elapsed, move to Phase 3.

Phase 3: Measuring the Melt

Phase 3 will determine how successful the thermal-insulator containers protect the ice from heat.

- Time:** 15 minutes
- Materials:** Keep It Cool datasheet
Small container
Scale
Thermometer



Instructions:

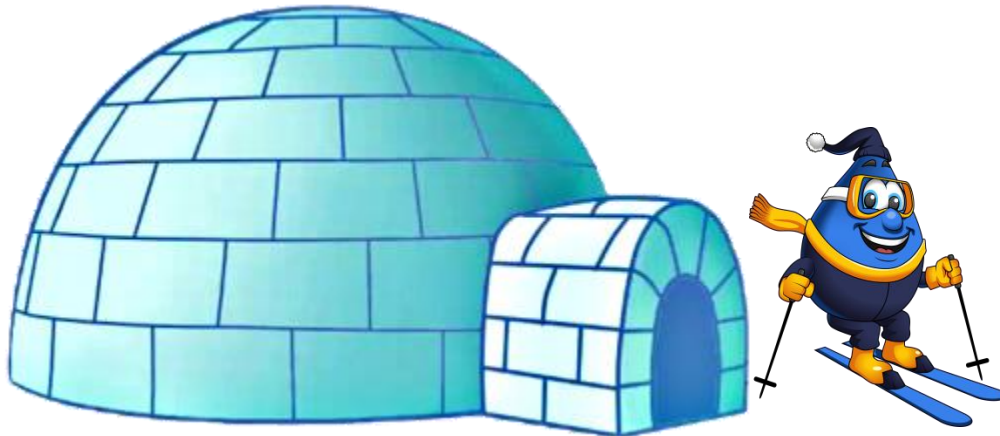
- Have each group quickly take apart their thermal-insulator container.
- Pour the water that has collected inside the 1-liter bottle into another container and weigh.
- Using the Keep It Cool datasheet, have the students calculate the percentage of ice that has melted.
- If all of the ice has melted, students should measure the temperature of the water.
- Allow groups to compare results.
- Discuss the findings. Were some insulating materials more successful at protecting the ice from melting?

Keep It Cool continued...



Dive Deeper

Want to learn more? Check out the It's Okay to Be Smart PBS episode entitled *How an Igloo Keeps You Warm*, <https://www.youtube.com/watch?v=1L7EI0vKVuU>.



Discussion Questions

1. Why are thermal insulators important in everyday life?
2. How can thermal insulators be used to reduce the amount of energy a person uses?
3. Are there situations when too much insulation could be harmful?

Additional Resources

- ◆ Explain That Stuff, Heat Insulation: <http://www.explainthatstuff.com/heatinsulation.html>
- ◆ Ask a Physicist, How does House Insulation Work: <http://www.physicscentral.com/experiment/askaphysicist/physics-answer.cfm?uid=20080512100527>
- ◆ BBC, How Insulation Works: http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/energy_home/1_keeping_homes_warm1.shtml
- ◆ US Department of Energy, Insulation: <https://energy.gov/energysaver/weatherize/insulation>
- ◆ Scientific American, Staying Warm With Thermal Insulation: <https://www.scientificamerican.com/article/stay-warm-with-thermal-insulation/>