

Insulators on a Graph

Grade 5

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Benchmarks & Objectives:

PS-1: Define temperature as the measure of thermal energy and describe the way it is measured.

PS-2 Trace how thermal energy can be transferred from one object to another by conduction.

Math: Graphing Skills

Materials:

- A thermos, a Styrofoam cup with lid (large), a metal container (large)
- Dihydrogen monoxide (a fancy name for water!)
- Three graduated cylinders
- Three thermometers

Initial Demonstration:

Bring in a cup of coffee that someone might buy at a coffee shop (to go). Ask the students why the coffee came in a cup like this? (The cup is Styrofoam because it is a good insulator. The cup has a lid to prevent heat from escaping. The cup has a cardboard ring to prevent a person from burning their hand on the cup.)

Lead the class to design an experiment that tests how good an insulator is. You may want to refer to a previous experiment where the temperature of hot, cold, and lukewarm water was measured as a function of time. Discuss how to make sure the experiment is fair. What are the controls? What is the independent variable (time) and what is the dependent variable (temperature). You can test many things, a thermos, a plastic cup, a Styrofoam cup with or without a lid, etc.

Procedure:

1. Heat water in a hot pot to near boiling.
2. Record the temperature of the water.
3. Measure 100 ml of water in three graduated cylinders and pour into three separate containers (thermos, Styrofoam cup, and metal cup).
4. Start the timer. Measure the temperature at some regular interval (to be determined by the students).
5. Make a data table on the board.
6. During the time between measurements, have the students individually start to plot the data on a graph (see attached).
7. Use different colored pencils for the different cup.
8. Emphasize the steps in making a graph: Use a title. Label the axes. Determine the interval of the axes. Plot the data. Connect the data points. Make a legend.

Discussion:

Discuss that although there are many kinds of insulators, some are better than others. Use this opportunity to explain that a thermos uses a vacuum as an insulator. That is to say that there is a layer in the thermos that has had almost all the air sucked out. As a result, there are no atoms (particles, molecules) to bump into one another and carry thermal energy outward.

Name: _____

Title: _____

Legend:

Container A

Container B

Container C

