

LESSON
97

LAB

Heat Versus Temperature

Heat Transfer

Name _____

Date _____ Period _____

Purpose

To discover the factors that affect heat transfer between two samples of water.

Materials

- large foam cup
- 100 mL graduated cylinder
- hot plate
- 250 mL beakers (2)
- thermometer
- crushed ice

Procedure

1. Measure and record a volume of water. Pour it into the foam cup and record the temperature.
2. Measure and record a second volume of water. Pour it into a beaker and either heat or cool the water using a hot plate or ice. Record the temperature.
3. Add the second sample to the first. Stir, watching the thermometer closely. Record the temperature after it has stabilized.
4. Repeat your experiment using different volumes and temperatures. Create a data table with the results from at least three experiments.
5. Convert volume measurements to mass. The density of water is 1 g/mL.

Questions

1. Imagine that you mix 25 g of water at 25 °C with 25 g of water at 65 °C. Predict the final temperature of the sample.
2. Imagine that you mix 25 g of water at 25 °C with a larger sample of water at 65 °C. Will the final temperature be the same as in question 1? Why or why not?
3. Suppose you mix 75 g of water at 15 °C with 25 g of water at 75 °C. Predict the final temperature from the choices. Explain your choice.
a. 30 °C b. 45 °C c. 60 °C

Chemists measure the amount of heat transferred from one sample to another in units of calories. A **calorie** is the amount of energy needed to raise the temperature of 1 g of water 1 °C.

4. You heat 2 g of water from 25 °C to 26 °C. How many calories of energy are transferred to the water?

5. You heat 1 g of water from 40 °C to 45 °C. How many calories of energy are transferred to the water?
6. You heat 200 mL of water from 25 °C to 75 °C. How many calories of energy are transferred to the water?
7. You cool 10 grams of water from 25 °C to 5 °C. How many calories of energy are transferred out of the water?
8. **Making Sense** How are the motions of the water molecules in samples of hot and cold water different?

What happens to the motions of the water molecules if you mix hot and cold water?

Use changes in molecular motion to explain how energy from the hot water is transferred to the cold water.

9. **If You Finish Early** Predict the final temperature if you mix 15 g of water at 20 °C with 45 g of water at 80 °C. Show your work.