LESSON 98

LAB

The Heat Is On
Specific Heat Capacity

Name _____

Date _____ Period _____

Purpose

To analyze energy transfer between different substances.

Materials

- 5 cm brass rod
- large foam cup
- 100 mL graduated cylinder
- 250 mL beaker
- hot plate
- balance

Procedure and Questions

1. Obtain a 5 cm brass rod and determine its mass. Obtain an amount of water with the same mass as the rod. Place both on the counter and allow them to reach thermal equilibrium with the air in the room. Determine and record the temperature of the brass rod, the water, and the air.

2. Explain the differences or similarities in the temperatures.

3. Measure and record the temperature of your hand.

4. Why isn't your body in thermal equilibrium with the room?

5. Hold a metal sample in your hand. What do you feel?

6. Place the brass rod in the foam cup. In a beaker, measure a sample of hot water (70 °C) that weighs the same as the brass rod. Before you pour the hot water into the cup, predict the final temperature of the water and the rod. Explain your thinking.

7. Add the hot water to the cup. Record the data you will need in order to determine the heat transferred *from* the hot water *to* the cold metal.

8. Is the final temperature different from your prediction? If so, why?

The amount of energy needed to raise the temperature of 1 g of a substance 1 °C is called its **specific heat capacity.** The specific heat capacities of several substances are listed in the table.

Substance	Specific heat capacity
water, H_2O	1.00 cal/g °C
methanol, CH_3OH	0.58 cal/g °C
air (sea level, dry)	0.24 cal/g °C
aluminum, Al	0.21 cal/g °C
brass, CuZn	0.090 cal/g °C

9. Which substance listed in the table requires the least amount of energy to raise the temperature of 1 g of the substance 1 °C?

10. How many calories of energy are needed to raise the temperature of 53 g of brass 45 °C?

11. Imagine that you transfer 5 calories of energy to 1 g of water and to 1 g of brass. Which sample will be at a higher temperature? Explain your thinking.

12. Making Sense Imagine that you place an aluminum pot filled with water on the stove. After several minutes, the metal is too hot to touch, but the water is barely warm. Use specific heat capacity to explain why.

13. If You Finish Early Suppose 1 kg of water at a temperature of 45 °C is mixed with 1.5 kg of methanol at 20 °C. What is the final temperature of the mixture?