

OBJECTIVES

- **Measure** temperature.
- **Apply** the specific heat capacity equation for calorimetry to calculate the specific heat capacity of a metal.
- **Identify** unknown metals by comparing their specific heat capacities with accepted values for specific heat capacities.

MATERIALS LIST

- 2 beakers
- 2 thermometers
- balance
- hand-held magnifying lens
- hot plate
- ice
- metal calorimeter and stirring rod
- metal heating vessel with metal heating dipper
- samples of beads or shot formed from various metals
- small plastic dish

In this experiment, you will use calorimetry to identify various metals. In each trial, you will heat a sample of metal by placing it above a bath of water and bringing the water to a boil. When the sample is heated, you will place it in a calorimeter containing cold water. The water in the calorimeter will be warmed by the metal as the metal cools. According to the principle of energy conservation, the total amount of energy transferred out of the metal sample as it cools equals the energy transferred into the water and calorimeter as they are warmed. In this lab, you will use your measurements to determine the specific heat capacity and identity of each metal.

SAFETY

- **When using a burner or hot plate, always wear goggles and an apron to protect your eyes and clothing. Tie back long hair, secure loose clothing, and remove loose jewelry. If your clothing catches on fire, walk to the emergency lab shower and use the shower to put out the fire.**
- **Never leave a hot plate unattended while it is turned on.**
- **If a thermometer breaks, notify the teacher immediately.**
- **Do not heat glassware that is broken, chipped, or cracked. Use tongs or a mitt to handle heated glassware and other equipment because it does not always look hot when it is hot. Allow all equipment to cool before storing it.**
- **Never put broken glass or ceramics in a regular waste container. Use a dustpan, brush, and heavy gloves to carefully pick up broken pieces and dispose of them in a container specifically provided for this purpose.**

PROCEDURE**Preparation**

1. Read the entire lab procedure, and plan the steps you will take. Determine which steps can be performed while you are waiting for the water to heat.
2. If you are not using a datasheet provided by your teacher, prepare a data table in your lab notebook with four columns and eight rows. In the first row, label the second through fourth columns *Trial 1*, *Trial 2*, and *Trial 3*. In the first column, label the second through eighth rows *Sample Number*, *Mass of Metal*, *Mass of Calorimeter Cup and Stirrer*, *Mass of Water*, *Initial Temperature of Metal*, *Initial Temperature of Water and Calorimeter*, and *Final Temperature of Metal, Water, and Calorimeter*.