

Specific Heat Capacity

MATERIALS LIST

- beakers, 2
- balance
- hot plate
- ice
- LabPro® or CBL2™ interface
- metal calorimeter and stirring rod
- metal heating vessel with metal heating dipper
- samples of various metals in shot or bead form
- small plastic dish
- stainless steel temperature probe
- TI graphing calculator with link cable

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.
- Do not heat glassware that is broken, chipped, or cracked. Use tongs or a mitt to handle heated metal, 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

Follow Preparation steps 1–3 for the Skills Practice Lab “Specific Heat Capacity” in the chapter “Heat.”

Finding the Specific Heat Capacity of a Metal

4. Choose a location where you can set up the experiment away from the edge of the table and away from other groups. Make sure the hot plate is in the “off” position before you plug it in.

5. Fill a metal heating vessel with 200 mL of water, and place it on the hot plate. Turn on the hot plate, and adjust the heating controls to heat the water.

6. Set up the calculator and interface for data collection:

- a. Connect the LabPro or CBL2 interface to the calculator with the unit-to-unit link cable.
- b. Connect the temperature probe to the CH1 port on the interface. Turn on the calculator and start the DataMate® program.
- c. Press CLEAR to reset the program.

- d. Hold the temperature probe in the air with nothing touching it. Observe the temperature readings displayed on the calculator. When the readings are stable, record the displayed temperature in your data table as the room temperature.

7. Obtain about 100 g of the metal shot. First, measure the mass of the small plastic dish. Place the metal shot in the dish, and determine the mass of the shot. Record the number and the mass of the shot in your data table. Place the temperature probe in the metal heating dipper, and carefully pour the shot into the metal heating dipper. Make sure the temperature probe is surrounded by the metal shot.

8. Place the dipper containing the shot into the top of the heating vessel, as shown in **Figure 1**. Make sure the temperature probe cable does not touch the hot plate or any heated surface.

9. While the sample is heating, find the mass of the empty inner cup of the calorimeter and the stirring rod. Record the mass in your data table. *Do not leave the hot plate unattended.*

10. For the water in the calorimeter, you will need about 100 g of cold water. The water must be colder than room temperature. (Do not use water colder than 5°C below room temperature. If ice is used to cool the water, make sure all the ice has melted before pouring the water into the calorimeter.)