CONSTRUCTING THE CALORIMETER

1. Trim the lip of one plastic-foam cup, and use that cup as the top of your calorimeter. The other cup will be used as the base.
2. Use the pointed end of a pencil to gently make a hole in the center of the calorimeter top. The hole should be large enough to insert a thermometer. Make a hole for the wire stirrer. As you can see in Figure A, this hole should be positioned so that the wire stirrer can be raised and lowered without interfering with the thermometer.
3. Place the calorimeter in a beaker to prevent it from tipping over.

CALIBRATING A PLASTIC-FOAM CUP CALORIMETER

1. Measure 50 mL of distilled water in a graduated cylinder. Pour it into the calorimeter. Measure and record the temperature of the water in the plastic-foam cup.
2. Pour another 50 mL of distilled water into a beaker. Set the beaker on a hot plate, and warm the water to about 60°C, as shown in Figure B. Measure and record the temperature of the water.
3. Immediately pour the warm water into the cup, as shown in Figure C. Cover the cup, and move the stirrer gently up and down to mix the contents thoroughly. **Take care not to break the thermometer.**

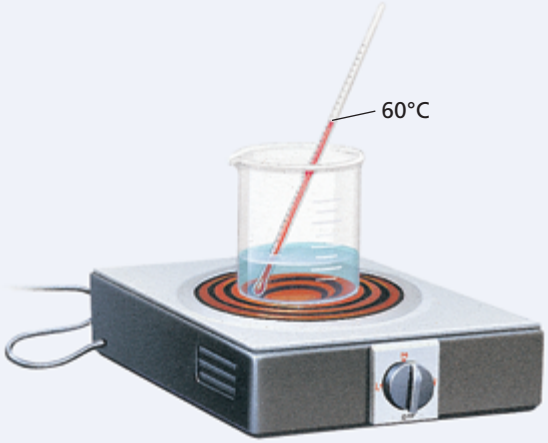

FIGURE B Heat the distilled water to approximately 60°C.

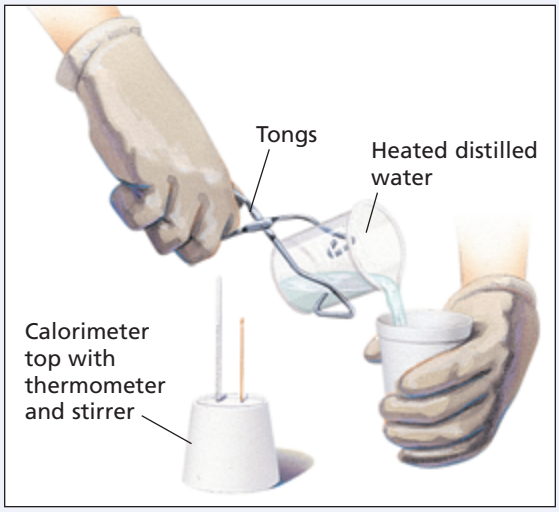

FIGURE C When transferring warm water from the beaker to the calorimeter, hold the bottom of the calorimeter steady so it does not tip over.

4. Watch the thermometer, and record the highest temperature attained (usually after about 30 s).
5. Empty the calorimeter.
6. The derivation of the equation to find the calorimeter constant starts with the following relationship.

   Energy lost by the warm water = Energy gained by the cool water + Energy gained by the calorimeter

   $$q_{warm\ H_2O} = q_{cool\ H_2O} + q_{calorimeter}$$

   The energy lost as heat by the warm water is calculated by the following equation.

   $$q_{warm\ H_2O} = mass_{warm\ H_2O} \times 4.184\ J/g{\bullet}°C \times \Delta t$$

   The energy gained as heat by the calorimeter system equals the energy lost as heat by the warm water. You can use the following equation to calculate the calorimeter constant C′ for your calorimeter.

   $$q_{calorimeter} = q_{warm\ H_2O} = (mass_{cool\ H_2O})\ (4.184\ J/g{\bullet}°C)\ (\Delta t_{cool\ H_2O}) + C'(\Delta t_{cool\ H_2O})$$

   Substitute the data from your calibration, and solve for C′.