

CHEMISTRY LAB

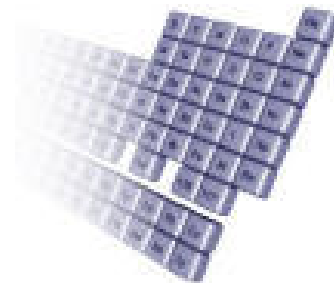
Thermochemistry: Calorimetry



HEAT CAPACITY OF AN UNKNOWN METAL

■ MATERIALS

unknown metal sample
calorimeter
2 thermometers
electronic balance
hotplate
beaker for water bath
beaker tongs
test tube tongs or crucible tongs
100 mL graduated cylinder
electronic timer



■ PROCEDURE

1. Fill the beaker approximately two-thirds with water and start a boiling water bath at your lab bench on a hotplate.
2. Obtain an unknown metal sample. Using the electronic balance, weigh your sample three times and record the mass in the data table. Mass should be recorded to the hundredth of a gram. Determine the average of the masses.
3. Using the test tube tongs or crucible tongs, **carefully place** your metal sample in the boiling water bath. **Do not drop the sample in the bath.** This will cause the beaker to shatter.
4. Allow the metal to bathe for 5 minutes.
5. Using the graduated cylinder, measure 50.0 mL of water and place it in the calorimeter.
6. Place the top on the calorimeter with the thermometer and allow it to stand for 2 minutes. Record the temperature of the calorimeter.
7. **Very carefully and quickly**, in one smooth motion, transfer the metal from the hot water bath to the calorimeter and seal. **Immediately** record the temperature and start the timer.

**READ
ALL
INSTRUCTIONS
BEFORE
PROCEEDING**

8. Record the temperature every 10 seconds. Stop recording when the temperature does not change for three intervals.
9. Retrieve the metal sample and pour the water from the calorimeter down the drain.
10. Repeat steps **3 through 9** two more times.
11. When done with three trials, carefully remove the beaker from the hot plate and place it on the lab bench. Turn off the hot plate and unplug it.

Remember: 1 mL of H₂O = 1 g of H₂O

$$-q_{\text{metal}} = +q_{\text{water}}$$

12. Calculate the Cp (heat capacity, or specific heat) of the metal for each trial and record the answers in the table. Make sure to show all calculations.
 13. Determine the average Cp. Use your periodic table to verify which unknown metal you used.
 14. Calculate the percent error.
 15. Discuss at least 3 possible ways for heat to be lost in this experiment (accounting for the percent error).
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