

Determination of the Specific Heat of a Metal Experiment

Procedure, Assignment & *Mini-Report* Guidelines

READING: Experiment (this handout) & *Chemistry*, 5th ed. by Silberberg: Section 6.3

PROCEDURE / DATA / CALCULATIONS / RESULTS

Determine the specific heat of a metal.

1. *Before coming to lab*, prepare a data table like the one below in your lab manual:

	Trial 1	Trial 2	Trial 3	Additional Trials (if needed)
Mass of calorimeter				
Mass of calorimeter + 20 ml water				
Mass of water				
Initial temperature of cold water (in calorimeter)				
Mass of metal spheres				
Initial temperature of hot metal spheres				
Final temperature				
Calculated specific heat (C_p)				
Average specific heat (C_p)				
Relative range (of the consistent trials)				
Identity of metal & Literature value for C_p				
Percent error				

Prepare in
LAB
NOTEBOOK.

- Set up a hotplate with a 400-600 mL beaker half full of water. Heat the water to boil.
- Measure the mass of several of the metal spheres. You should have a mass of about 35 grams metal. Put these massed spheres into a test tube, which is placed into the boiling water bath.
- Measure the mass of the calorimeter and add ~ 20 mL water. Measure the mass again (calorimeter + 20 mL water). Calculate the mass of the water.
- Once the spheres, in the test tube, have been in the boiling water at least ten minutes, use your thermometer to measure the water temperature. Record this and set the thermometer into a beaker of cold water.
- Measure the temperature of the cold water in the calorimeter. Add the hot metal spheres.
- Swirl the water and record the temperature once the water temperature has stabilized.
- Dry off the metal spheres and repeat the experiment to obtain three good trials (relative range of the specific heat < 10%)
- Calculate the specific heat capacity of the metal (Show one complete calculation). Assume the heat absorbed by the calorimeter is negligible.
- Report your value to the instructor. You will be provided with the identity of the metal. Based on the literature value of the specific heat, calculate your percent error.

DISCUSSION QUESTIONS

- If we had accounted for the heat absorbed by the calorimeter, how would that have affected the calculated value for the specific heat? Would it have been larger or smaller? Be specific, referring to how heat is transferred and the equation(s) used to calculate the specific heat capacity.
- Considering your answer to number 1, does the loss of heat to the calorimeter account for the error you observed in the experiment?

POST-LAB QUESTIONS *As assigned by your instructor.*