

FINDING THE SPECIFIC HEAT OF A METAL – CHEMISTRY Name: _____ Pd: _____

PURPOSE: To determine the specific heat of a metal by interacting a sample of the metal with water in a calorimeter.

SAFETY NOTES:

- ❖ Wear goggles through the entire lab
- ❖ Be careful when handling the test tubes and metal - they may be hot!

MATERIALS:

graduated cylinder	Styrofoam cup calorimeter	large test tube
metal sample	400 mL beaker	test tube tongs
thermometer	hot plate	

PROCEDURE:

1. Fill a 400 mL beaker with 320 mL of water and heat to boiling. [Note: You must be monitoring your boiling water at all times! Do not let it boil to dryness! Add more water if necessary.]
2. Weigh your sample of metal and record the mass in the data table.
3. When the water is boiling, place your sample in the hot water bath for 10 minutes. While waiting complete steps 4-7.
4. Using a graduated cylinder, pour exactly 200.0 mL of water into your calorimeter.
5. Turn on your LabQuest and connect your Temperature probe. The LabQuest should automatically recognize the probe and you should see a temperature reading in °C in the red box on the screen. If you do not see a temperature, let your teacher know.
6. Place the temperature probe in the calorimeter water and let it sit until the temperature levels off. Record this temperature as the initial temperature of the water in the calorimeter. (It may fluctuate a bit in the last decimal place. Use your best judgement to decide when the temperature has stabilized.)
7. After the metal has been in the boiling water for 10 minutes, place the temperature probe in the boiling water and record the temperature (this will be the same as the metal).
8. Remove the temperature probe and allow to cool for 1-2 minutes.
9. Using tongs, quickly move the metal from the boiling water into the calorimeter. Stir the contents of the calorimeter with the temperature probe for 30 seconds. Record the highest temperature attained by the water in the calorimeter. This will be your final temperature.
10. Perform three trials. When finished, dry your metal and return all your materials to where you found them. Wipe your table dry and throw away all paper towels.

DATA:

Metal Letter:	Trial 1	Trial 2	Trial 3
Mass of Metal (g)			
Initial temperature (°C) of metal			
Initial temperature (°C) of water in calorimeter			
Final temperature (°C) of water in calorimeter			

CALCULATION: Calculate the specific heat (c) of your metal in each trial using $q=mc\Delta T$. Show **all** of your work for each trial.

CONCLUSION:

1. What was the average specific heat you calculated?

2. Using the data table below, what metal did you have? Justify your answer.

Aluminum	.902
Copper	.385
Iron	.449
Silver	.235
Lead	.128
Zinc	.39
Magnesium	1.05

3. Calculate your percent error.

$$\% \text{ Error} = \left| \frac{\text{Theoretical Value} - \text{Experimental Value}}{\text{Theoretical Value}} \right| \times 100$$

Theoretical Value = Actual ... Known ... True Value

4. List three specific sources of error in this experiment. (“Human error” or “Wrong Calculations” and “Rounding/Sig Figs” are not valid types of errors.)