

Name _____	Lab Partner _____	
TA Name _____	Section _____	Date _____

**Calorimetry Worksheet**

As you work through the steps in the lab procedures, record your experimental values and the results on this worksheet.

**Table A:** Validating the Assumption about Insulation

	Mass (g)	Temperature (°C)
Cups and cover		N/A
Cups, cover, and cold water		N/A
Cold water		
Cups, cover, and mixture		
Warm water		

1. When the cold and warm water are mixed, do you expect  $\Delta T_{cold\ water}$  and  $\Delta T_{warm\ water}$  to have the same value or different values? What about  $q_{cold\ water}$  and  $q_{warm\ water}$ ?

2. Calculate  $\Delta T_{cold\ water}$ ,  $\Delta T_{warm\ water}$ ,  $q_{cold\ water}$ , and  $q_{warm\ water}$ . Show your work.

$\Delta T_{cold\ water}$	°C
$\Delta T_{warm\ water}$	°C
$q_{cold\ water}$	kJ
$q_{warm\ water}$	kJ

3. Confer with your lab partner and instructor. In this experiment, what is the system and what are the surroundings?

4. When the metal and water are mixed, do you expect  $\Delta T_{metal}$  and  $\Delta T_{water}$  to be the same or different?

5. When the metal and water are mixed, do you expect  $q_{metal}$  and  $q_{water}$  to be the same or different?

**Table B:** Identifying Unknown Metal by Specific Heat

	Mass (g)	Temperature (°C)
Unknown metal # _____		
Cups and cover (from Part A)		N/A
Cups, cover, and cold water		N/A
Cold water		
Mixture of metal and water	N/A	

6. Calculate the specific heat of the metal. Show your work.

7. What is the identity of the metal? Refer to the table below.

Specific Heats of Selected Metals

Metal	$s_{\text{metal}}$ , J/g·°C	Metal	$s_{\text{metal}}$ , J/g·°C
Al	0.901	Fe	0.449
Cu	0.384	Ni	0.444
Si	0.711	Sn	0.226
Zn	0.389	Mn	1.02

**Table C:** Identifying Unknown Metal by Specific Heat

	Mass (g)	Temperature (°C)
Cups and cover (from Part A)		N/A
NH <sub>3</sub> solution	N/A	
Cups, cover and mixed solution		N/A
mixed solution		

8. What is  $\Delta H$  for this reaction?

Show your work.

9a. Using volume and concentration, how many moles of NH<sub>3</sub> and H<sub>3</sub>PO<sub>4</sub> were mixed together?

9b. What is the molar value for  $\Delta H$  for this reaction? Show your work.

10. Calculate the amount of  $\text{NH}_4\text{H}_2\text{PO}_4$  that you made in Part C in grams.

**Table D:** Heat of Solution

	Mass (g)	Temperature ( $^{\circ}\text{C}$ )
Cups and cover (from Part A)		N/A
Cups, cover, and water		N/A
Water		
Solution	N/A	
Solid $\text{NH}_4\text{H}_2\text{PO}_4$		N/A

11. Confer with your lab partner and instructor. In this experiment, what is the system and what are the surroundings?

12. How would you expect the molar change in enthalpy ( $\Delta H$ ) for this reaction to compare with the heat of neutralization in Part C? (If you would like to check, calculate it now. You will be asked for the value in the WebAssign postlab exercise.)