

Name \_\_\_\_\_ Section \_\_\_\_\_

Partner \_\_\_\_\_

### CHM 111 Lab 5 Report Form

Graph all data for each of the 4 reactions, and indicate on the graph when the reactant was added. As described in the introduction, calculate  $\Delta T$ . As always, show sample calculations. See the graphing tips for help drawing 2 lines on one graph, and look carefully at the example in the lab introduction.

Use the following data to calculate  $\Delta H$  in kJ/mol. Think carefully about your masses (hint: the first solution has a mass of ~52.5 g).

The density of water is 1.00 g/mL.

The specific heat of your  $\text{NH}_4\text{Cl}(\text{aq})$  is 4.00 J/g $^\circ\text{C}$ .

The specific heat of your  $\text{NaOH}(\text{aq})$  is 3.93 J/g $^\circ\text{C}$ .

The density of the  $\text{NaCl}(\text{aq})$  produced is 1.02 g/mL, and its specific heat is 4.02 J/g  $^\circ\text{C}$ .

Heats of solution:

Rxn		Mass solid (g)	Mass soln (g)	$\Delta T$ ( $^\circ\text{C}$ )	$\Delta H$ (kJ/mol)
1	$\text{NH}_4\text{Cl}(\text{s})$				
2	$\text{NaOH}(\text{s})$				

Heats of Neutralization:

Rxn		Mass solid (g)	Mass soln (g)	$\Delta T$ ( $^\circ\text{C}$ )	$\Delta H$ (kJ/mol)
3	$\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq})$	N.A.			
4	$\text{NaOH}(\text{s}) + \text{HCl}(\text{aq})$				

Show how the data for reactions 2, 3 and 4 represent an example of Hess's Law. Mathematically manipulate the balanced equations for 2 and 3 so that you generate the equation for 4. Combine the associated enthalpies in the same fashion to generate a theoretical value for  $\Delta H$  for reaction 4.

Rxn \_\_\_\_\_  $\Delta H$  \_\_\_\_\_

Rxn \_\_\_\_\_  $\Delta H$  \_\_\_\_\_

Net Rxn \_\_\_\_\_ Calc.  $\Delta H$  \_\_\_\_\_

Find the percent difference between the calculated  $\Delta H$  from Hess's law and the directly measured  $\Delta H$  from the table (show work):

$$\% \text{ Diff} = \left| \frac{x_1 - x_2}{(x_1 + x_2)/2} \right| \times 100$$