

Enthalpy of Neutralization

Name: _____

Section: _____

Partner: _____

Date: _____

Purpose (goal of the experiment):

DATA

Solutions Concentrations: NaOH _____ HCl _____ H₃PO₄ _____

1. Determining the Calorimeter Constant

Trial 1

Trial 2

Initial cold water temperature:

_____ °C

_____ °C

Initial hot water temperature:

_____ °C

_____ °C

Final temperature (from temperature – time graph):

_____ °C

_____ °C

ΔT_C

_____ K

_____ K

ΔT_H

_____ K

_____ K

C_{cal}

_____ J/K

_____ J/K

Average C_{cal}

_____ J/K

Show calculations for one trial and attach the temperature – time graphs:

2. Enthalpy of Neutralization HCl - NaOH

Trial 1

Trial 2

Initial temperature:

_____ °C

_____ °C

Final temperature (from temperature – time graph):

_____ °C

_____ °C

ΔT

_____ K

_____ K

$q = - (q_1 + q_2)$

_____ J

_____ J

ΔH

_____ kJ/mol

_____ kJ/mol

Average ΔH

_____ kJ/mol

Theoretical ΔH (from prelab)

_____ kJ/mol

Show calculations for one trial and attach the temperature – time graphs:

q_1

q_2

n

ΔH

3. Enthalpy of Neutralization H_3PO_4 - NaOH

Trial 1

Trial 2

Initial temperature:

_____ °C

_____ °C

Final temperature (from temperature – time graph):

_____ °C

_____ °C

ΔT

_____ K

_____ K

$q = - (q_1 + q_2)$

_____ J

_____ J

ΔH

_____ kJ/mol

_____ kJ/mol

Average ΔH

_____ kJ/mol

Theoretical ΔH (from prelab)

_____ kJ/mol

Show calculations for one trial and attach the temperature – time graphs:

q_1

q_2

n

ΔH

Post Lab Questions

1. Suppose that at the end of the experiment it was discovered that the thermometer had not been calibrated. When it was calibrated, it was found that thermometer read 0.50 °C low. What effect would this thermometer reading have on the experimental ΔH values calculated above? Explain your answer.

2. How do the experimental ΔH values agree with theoretical values? Calculate percent errors (show calculations) to support your answer.

3. What are the largest sources of error in the experiment (mention at least two). Explain your answer.

4. The experimental procedure requires that you wash your thermometer and dry it after measuring the temperature of the NaOH solution and before measuring the temperature of the HCl solution. Explain why.