

Name: _____

Date: _____

Lab – Determining the Enthalpy of Reaction

PURPOSES:

- Experimentally determine the enthalpy of reaction for the reaction of sodium hydroxide and sulfuric acid.
- Find the theoretical maximum temperature graphically.
- Calculate the theoretical value for the enthalpy of reaction using standard enthalpies of formation for one mole of NaOH.
- Compare these two values to each other by calculating percent error.

MATERIALS: coffee cup calorimeter, thermometer, graduated cylinders, 1 M sodium hydroxide solution, 1 M sulfuric acid solution.

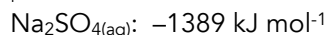
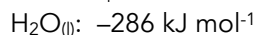
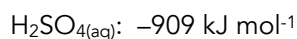
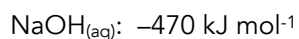
PROCEDURE:

Working with your lab partner, decide upon a procedure, which will allow you to determine experimentally the enthalpy of this reaction. In order to accomplish this, you will need to write down the balanced equation for the reaction and then determine amounts of reactants needed, such that there is NO LIMITING REACTANT, and NO EXCESS REACTANT. This means you will need to do some basic stoichiometry before getting started. Make sure not to exceed the capacity of your calorimeter. It can hold a total of about 300 mL comfortably. I recommend you not fill your cup greater than 1/2 way to ensure safety. Your data should include a temperature reading every 20 seconds for 10 minutes (and should include readings with just one reactant liquid in the container for at least 60 seconds)

QUESTIONS / CALCULATIONS:

1. Show all necessary calculations for determining the experimental enthalpy of the reaction which took place in your cup.
2. Using the calculation from part 1, show the calculations necessary to find the change in enthalpy for the equation as written (per mole of NaOH)
3. Show the calculations necessary to find the theoretical change in enthalpy for the equation as written.
4. Graph the temperature data and calculate what the theoretical temperature rise in your cup should have been (extrapolate).

Helpful numbers: (Enthalpy of formation)



5. Calculate your percent error.

CONCLUSION:

Write a conclusion which explains the math of the lab, discusses assumptions that you made and possible sources of error.

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Question #1: Use $\Delta H = mC\Delta T$ (assuming the mass is that of water only).

Question #2: Use the answer from question 1, but now you need to determine the heat of reaction per mole of NaOH.

Question #3: $\Delta H = \text{products} - \text{reactants}$

Question #4: Make the graph (computer) and then add the extrapolation line by hand.

Question #5: $(\text{measured} - \text{actual})/\text{actual} \times 100$