

# Heat of neutralization assignment



**ASSIGN  
BUSTER**

Heat of Neutralization: Lab Report In part A of this lab I determined the heat capacity of a calorimeter made out of two Styrofoam cups nesting together with a cardboard top containing a hole in the middle. First I placed 50 mL of water in the calorimeter, waited five minutes for the water to reach equilibrium, and used the computer's temperature instrument to record the final temperature of the system. Next I heated 50 mL of water in a 250 mL beaker until the water reached 43.1 C (approximately 15 to 20 C above room temperature).

I then immediately used the temperature instrument to measure the temperature of the heated water, and quickly poured the water into the calorimeter. I then inserted the temperature instrument and measured the temperature of the calorimeter for the next three minutes. I was then able to calculate the heat capacity of my calorimeter by using the data that was collected. In part B of the lab I determined the heat of neutralization for hydrochloric acid and sodium hydroxide. I did this by first putting 50. mL of 1.0 M NaOH into the dry calorimeter and placing the lid on the calorimeter, but I did not measure the temperature of the base yet. I then obtained 50.0 mL of 1.0 M HCl in a dry beaker. I then placed the beaker next to the calorimeter and allowed the systems to sit for three minutes to balance out the temperatures. I then used the temperature instrument to measure the temperatures of both the acid and the base to ensure that the temperatures were within 0.5 C of each other.

Next I completely poured all of the HCl into the calorimeter, inserted the temperature instrument into the calorimeter, and measured the temperature of the system for the next three minutes. I could then use the data collected

to determine the heat of neutralization for the reaction. The scientific principles addressed by the lab were using a calorimeter to measure the enthalpy change (or heat of reaction) of a system, and determining how much heat was absorbed by the calorimeter (heat capacity of the calorimeter).

I expected the results to show that the heat of neutralization of the acid-base reaction released a large amount of heat with the calorimeter absorbing some of the heat. My results did indeed show that the reaction released a large amount of heat, but my results also showed that the calorimeter did not absorb any heat. From my calculations, my results actually determined that the calorimeter had a heat capacity of  $-4.9$ , therefore I had to assume that the calorimeter had a heat capacity of  $0$  because I could not use a negative number in my reaction calculations. My reaction calculations showed me that the acid-base reaction released  $47640$  KJ per mole. Sources of error in this experiment include not accurately measuring the temperature of the systems and not completely transferring all of the acid into the base. In this experiment I learned how to determine the heat capacity of a calorimeter, and how to determine the change in enthalpy for a neutralization reaction.