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AP Chem experiment – Heat of neutralization.

Pre-lab considerations.

What is the net ionic equation for the reaction of dilute HCl(aq) with dilute NaOH(aq)?

Instructions:

Fill one burette with 1.00 molar HCl and the other with 1.00 molar NaOH. Run a small amount of each solution into a beaker. Take an initial reading of each solution.

Run 1 Run 2

Calculate what the final reading in each case would have to be to provide a volume of 40.00 mL.

Run1 Run 2

Add 40.00 mL of HCl solution to one beaker, and 40.00mL of NaOH solution to another.

Take the temperature of the solution in each beaker. They should BOTH be at the same temperature. Estimate to the nearest tenth of a degree.

Run 1 Run 2

Pour the entire acid solution into an insulated (styrofoam) cup, and then add in, as quickly as possible without splashing, the entire base solution. Insert the thermometer, and record the MAXIMUM temperature reached by the solution.

Run 1 Run 2

What is the temperature change, Δt, in the solution?

Run 1 Run 2

Assuming that the solution has a density of 1.00g/mL, what is the mass of the solution in grams?

Assuming that the solution has the same specific heat as water, how much heat was released during the reaction? Run 1 Run 2

How many moles of water were formed in the reaction?

How much heat was released PER MOLE OF WATER? Run1 Run 2

This is the heat of neutralization.

Answer the following questions. 1. Do you think that your value for the heat of neutralization is likely to be greater (in absolute value) or less than the book value? Explain.

2. How would it have affected your experimental value for the heat of neutralization, if both solutions had been made with warm water, and so were initially 30°C?

3. How would it affect your experimental value if the sodium hydroxide was actually 1.2 molar, while the HCl was actually 1.00 molar? Explain.

4. Would the heat of neutralization be different if you used acetic acid instead of hydrochloric acid? Explain