REGULAR LAB 12a: Enthalpy of Neutralization

Aim To calculate a value for the standard enthalpy of neutralization

Apparatus Insulated cup, thermometer, measuring cylinder

Chemicals 1.00 M hydrochloric acid solution, 1.00 M sodium hydroxide solution

Method

1. Using a graduated cylinder, place 50.0 mL of 1.00 M HCl solution into an insulated cup.
2. Record the initial temperature of the 1.00 M HCl solution.
3. Using a graduated cylinder, place 50.0 mL of 1.00 M NaOH solution into a second insulated cup.
4. Record the initial temperature of the 1.00 M NaOH solution.
5. **Carefully** combine the contents of the two cups in a single cup.
6. Keep stirring for several minutes and record the **highest** temperature reached.
7. Repeat the steps 1-6, this time using only 30.0 mL of each solution.

Results

With 50.0 mL of each solution

	HCl	NaOH
Initial temperature		
Average initial temperature of the solutions **(before mixing)**		
Temperature of solutions **(after mixing)**		
Change in temperature		

With 30.0 mL of each solution

	HCl	NaOH
Initial temperature		
Average initial temperature of the solutions **(before mixing)**		
Temperature of solutions **(after mixing)**		
Change in Temperature		

Conclusion/Calculation

1. Using the equation

$$q = (m)\,(c)\,(\Delta T)$$

Where;

m = total mass of the solutions (assume the density to be = 1.00 g mL^{-1})

c = specific heat capacity of the solutions (assume to be = 4.18 kJ kg^{-1} K^{-1})

ΔT = temp change

Calculate the energy change (q) in each of your experiments

With 50.0 mL of each solution

With 30.0 mL of each solution

2. By using your answers in question #1, calculate the **standard enthalpy of neutralization**, given the definition below. You will also need to write an equation for the reaction.

   The standard enthalpy of neutralization is the enthalpy change per mole of water, formed in a reaction between an acid and a base.

With 50.0 mL of each solution

With 30.0 mL of each solution