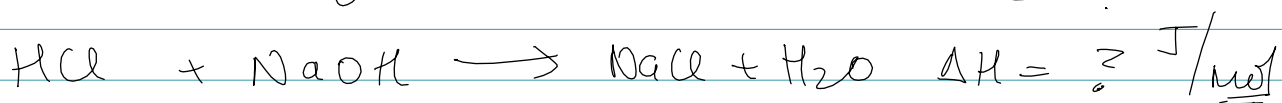


Thermochemistry - Calorimetry - 3 Heat of neutralization.

*) A 50.0 mL sample of 0.250 M HCl at 19.50°C is added to 50.0 mL of 0.25 M NaOH, also at 19.50°C in a calorimeter. After mixing the acid/base, the temp. rises to 21.21°C. Calculate the ΔH for this reaction.

Ans 50.0 mL of 0.250 M HCl T_i 19.50°C } T_f 21.21°C
50.0 mL of 0.25 M NaOH 19.50°C }



a) $50.0 + 50.0 = 100.0 \text{ mL} \times \frac{1 \text{ g}}{1 \text{ mL}} = 100.0 \text{ g}$

b) sp. heat H_2O $4.18 \text{ J/g}^\circ\text{C}$

$$\begin{aligned} q_{\text{cal.}} &= m \Delta T \\ &= 100 \text{ g} \times \frac{4.18 \text{ J}}{1 \text{ g}^\circ\text{C}} \times (21.21 - 19.50)^\circ\text{C} \\ &= 715 \text{ J} \quad \text{heat absorbed by cal.} \end{aligned}$$

$$q_{\text{rxn}} = -q_{\text{cal.}} = -715 \text{ J} \quad (\text{heat of reaction})$$

$$\Delta H = \text{J/mol}$$

$$\text{mol HCl} = 0.0500 \text{ L} \times 0.25 \frac{\text{mol}}{\text{L}} = 0.0125 \text{ mol HCl} \quad M = \frac{\text{mol}}{\text{L}} \Rightarrow \text{mol} = M \times L$$

$$\text{mol NaOH} = 0.0500 \text{ L} \times 0.25 \frac{\text{mol}}{\text{L}} = 0.0125 \text{ mol NaOH}$$

$$0.0125 \text{ mol HCl} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HCl}} = 0.0125 \text{ mol H}_2\text{O}$$

$$\Delta H = \frac{-715 \text{ J}}{0.0125 \text{ mol}} = -5.72 \times 10^4 \text{ J}$$

$$\equiv \boxed{-57.2 \text{ kJ}}$$