Acid #4

1. What is the concentration of a NaOH solution when 30 mL of 0.50 M HCl are needed to neutralize 50 mL of the base?

2. What is the concentration of acetic acid in vinegar when 32.5 mL of 0.56 M NaOH are required to neutralize 15 mL of vinegar?

3. What is the concentration of NH_3 in household ammonia when 48.25 mL of 0.525 M HCl are needed to neutralize 22.0 mL of the ammonia solution?

4. What is the concentration of an H_2SO_4 solution when 23 mL of 0.15 M KOH are needed to neutralize 15 mL of the acid?

5. A 5.0 g tablet of $Mg(OH)_2$ neutralizes 450 mL of HCl acid. What is the molarity of the HCl acid?

6. What mass of $Ca(OH)_2$ can be neutralized by 23 mL of 0.25 M HNO_3?

1. $mol\ H^+ = 30\ mL \times 0.50M = 15\ mmol\ H^+$

   $mol\ OH^- = mol\ H^+ = 15\ mmol\ OH^-$

   $[NaOH] = 15\ mmol / 50\ mL = 0.30\ M$

2. $mol\ OH^- = 32.5\ mL \times 0.56M = 18.2\ mmol\ OH^-$

   $mol\ H^+ = mol\ OH^- = 18.2\ mmol\ H^+$

   $[CH_3COOH] = 18.2\ mmol / 15\ mL = 1.2\ M$

3. $mol\ H^+ = 48.25\ mL \times 0.525M = 25.33\ mmol\ H^+$

   $mol\ OH^- = mol\ H^+ = 25.33\ mmol\ OH^-$

   $[NH_3] = 25.33\ mmol / 22.0\ mL = 1.15\ M$

4. $mol\ OH^- = 23\ mL \times 0.15M = 3.45\ mmol\ OH^-$

   $mol\ H^+ = mol\ OH^- = 3.45\ mmol\ H^+$

   $mol\ H_2SO_4 = 3.45\ mmol\ H^+ \left(\dfrac{1\ mol\ H_2SO_4}{2\ mol\ H^+} \right) = 1.73\ mmol$

   $[H_2SO_4] = \dfrac{1.73\ mmol}{15\ mL} = 0.12\ M$

5. $mol\ OH^- = 5.0\ g \div 58.3\ g/mol \times 2 = 0.172\ mol$

   $mol\ H^+ = mol\ OH^- = 0.172\ mol$

   $[HCl] = 0.172\ mol / .450\ L = 0.38\ M$

6. $mol\ H^+ = 23\ mL \times 0.25M = 5.75 \times 10^{-3}\ mol\ H^+$

   $mol\ OH^- = mol\ H^+ = 5.75 \times 10^{-3}\ mol\ OH^-$

   $mol\ Ca(OH)_2 = 5.75 \times 10^{-3}\ mol\ OH^- \left(\dfrac{1\ mol\ Ca(OH)_2}{2\ mol\ OH^-} \right) = 2.88 \times 10^{-3}\ mol$

   $mass\ Ca(OH)_2 = 2.88 \times 10^{-3}\ mol \times 74.1\ g/mol = 0.21\ g$