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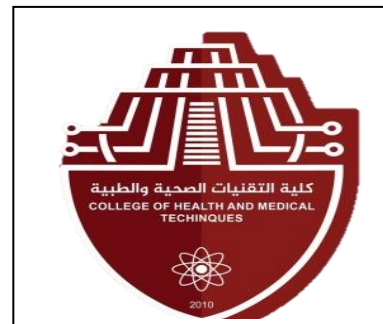
College of Health and Medical Techniques

Medical Laboratories Techniques Department

Stage : First year students

Subject : Lecture 9A

Lecturer: Assistant professor Dr. SADIQ . J. BAQIR



VOLUMETRIC (Titration) CALCULATIONS

In titration (a moles of ACID \equiv b moles of BASE)

Then

$$\frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}$$

M_a = molarity of the acid

M_b = molarity of the base

V_a = volume of the acid

V_b = volume of the base

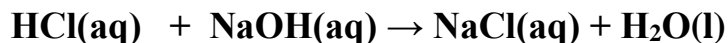
n_a = No. of moles (acid)

n_b = No. of moles (base)

Example 1:

The volume needed of a 0.1 M standard solution of HCl on titration of 100 mL of NaOH solution to the end point is 75.8 mL . Calculate the molar concentration of NaOH solution.

Solution:



$n_a = 1$ $n_b = 1$ (stoichiometric mole ratios of acid and base)

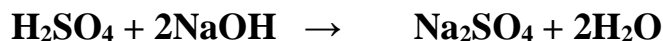
$$\frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}$$

$$\frac{75.8 \times 0.10}{1} = \frac{M_b \times 100}{1}$$

$$M_b = \frac{75.8 \times 0.10}{100} = 0.0758 \text{ M}$$

Example 2:

20 mL of H_2SO_4 (98 g/mol) was neutralized with 25mL of 0.1M sodium hydroxide solution. The equation of reaction is



Calculate:

- (i) conc. of acid in M (ii) acid content of the solution in grams.

Solution:

$$\frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}$$

$$\frac{M_a \times 20.0}{1} = \frac{0.10 \times 25}{2}$$

$$\text{Concentration of } \text{H}_2\text{SO}_4 (M_a) = \frac{1 \times 0.10 \times 25}{2 \times 20} = 0.0625 \text{ M}$$

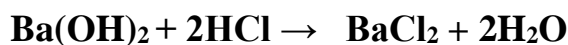
ii) mass of the acid in the solution(g)

mass (g) = Molarity(M) x Volume (L) x Molar mass (g/mol)

$$\text{mass (g)} = 0.0625 \times (20 \times 10^{-3}) \text{ L} \times 98 = 0.1225 \text{ g}$$

Example 3:

50 mL portion of HCl solution required 29.71 mL of (0.019M) Ba(OH)₂ to reach an end point with bromocresol green indicator , Calculate the molarity of HCl .

Solution:

1mole 2 mole 1mole

$$\frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}$$

$$\frac{M_{\text{HCl}} \times V_{\text{HCl}}}{2} = \frac{M_{\text{Ba(OH)}_2} \times V_{\text{Ba(OH)}_2}}{1}$$

$$M_{\text{HCl}} = \frac{2[M_{\text{Ba(OH)}_2} \times V_{\text{Ba(OH)}_2}]}{V_{\text{HCl}}}$$

$$M_{\text{HCl}} = \frac{2[0.019 \times 29.71]}{50} = 0.023 \text{ M}$$