6.32 g KMnO₄ = 6.32/158 moles KMnO₄ = 0.04 moles KMnO₄ Concentration of the solution = $0.04 \text{ mol } l^{-1}$ (= 0.04 M)

Question 8

A solution contains 4 g of NaOH in 250 cm³ of solution. Calculate the concentration of the solution in moles per litre.

Answer:

4 g of NaOH in 250 cm³ of solution is equivalent to $4 \times 1000/250 = 16$ g in 1 litre 16 g NaOH = 16/40 moles NaOH = 0.4 moles NaOH Concentration of the solution = $0.4 \text{ mol } l^{-1}$ (= 0.4 M)

Question 9

A solution contains 4.9 g H₂SO₄ in 100 cm³ of solution. Calculate the concentration of the solution in moles per litre.

Answer:

 $4.9 \text{ g of H}_2\text{SO}_4$ in 100 cm³ of solution is equivalent to $4.9 \times 1000/100 = 49 \text{ g in}$ it Concentration of the solution = $0.5 \text{ moles } H_2SO_4$ Question 10

g of ethanol (C₂) ₅OLD in 700 cm³ of solution. Calculate A bottle of wine cont

Answer:

49 g of C_2H_5OH in 700 cm³ of solution is equivalent to 49 x 1000/700 = 70 g in 1 litre $70 \text{ g C}_2\text{H}_5\text{OH} = 70/46 \text{ moles C}_2\text{H}_5\text{OH} = 1.52 \text{ moles C}_2\text{H}_5\text{OH}$ Concentration of the solution = $1.52 \text{ mol } l^{-1}$ (= 1.52 M)

Question 11

What mass of potassium hydroxide (KOH) is contained in 500 cm³ of 0.05 M potassium hydroxide solution?

Answer:

1,000 cm³ of 0.05 M KOH solution contains 0.05 moles 500 cm³ of 0.05 M KOH solution contains 0.05 X 500 / 1,000 moles = 0.025 moles

Molar mass of KOH = 56 g mol⁻¹

Mass of KOH contained in 500 cm³ solution = 56 X 0.025 g

Question 52

Crystals of hydrated sodium carbonate ($Na_2CO_3.xH_2O$) of mass 3.15 g were dissolved in water and made up to 250 cm³ in a volumetric flask. 25 cm³ of this solution required 15 cm³ of a 0.15 M hydrochloric acid solution for complete neutralisation. The equation for the reaction is

$$2HCl_{(aq)} + Na_2CO_{3(aq)} \rightarrow 2NaCl_{(aq)} + H_2O_{(l)} + CO_{2(g)}$$

Find (a) the concentration of the sodium carbonate solution (b) the value of x in the formula $Na_2CO_3.xH_2O$ (c) the percentage of water of crystallisation in the hydrated sodium carbonate.

Answer:

(a)
$$V_1 \times M_1 \times n_2 = V_2 \times M_2 \times n_1$$
$$15 \times 0.15 \times 1 = 25 \times M_2 \times 2$$
$$M_2 = 15 \times 0.15 \times 1 / (25 \times 2)$$
$$= 0.045 \text{ mol } l^{-1}$$

Concentration of the sodium carbonate solution = 0.045 mol l⁻¹

(b) Molar mass of Na₂CO₃.xH₂O =
$$46 + 12 + 48 + 18x = 106 + 18x$$

Concentration of sodium carbonate in mol l⁻¹ = 0.045 Concentration of sodium carbonate in g l⁻¹ = 34.5 Co. Mass of 0.045 moles of Na₂CO₃.xH₂O = 12.6 g

Molar mass of Na₂CO₃.xH₂O = 12.6 g

Molar mass of Na₂CO₃.xH₂O = 12.6 g

 $18x = 174$ x = 9.7

(c) Molar mass of hydrated sodium carbonate = $280~g~mol^{-1}$ Percentage of water of crystallisation in the compound = 174~x~100~/~280% = 62.14%

Question 53

In a titration, 25 cm³ of a potassium hydroxide solution required 27 cm³ of a 0.12 M sulfuric acid solution for complete neutralisation. Calculate the concentration of the potassium hydroxide solution in (a) mol l⁻¹ (b) g l⁻¹. The equation for the reaction is

$$H_2SO_{4(aq)} + 2KOH_{(aq)} \rightarrow K_2SO_{4(aq)} + 2H_2O_{(1)}$$

Answer: