Chapter 1. Some Basic Cioncepts of Chemistry

Question-1

Classify the following as pure substances or mixtures separate to pure substances into elements and compounds and divide the mixtures into homogeneous and heterogeneous categories:
(i) Bronze (ii) Smoke (iii) Pencil lead (iv) Antenna rod

Solution:

(i) Bronze = a mixture of Cu & Sn - Homogenous mixture.
(ii) Dust = a mixture of carbon particle and air - Heterogenous mixture.
(iii) Pencil lead = Pure element - Graphite.
(iv) Antenna rod = Aluminium.

Question-2

Calculate number of moles for the following ?
(i) 360 gms of H_2O (ii) 5.6 gms of Nitrogen (iii) 4 gms of NaOH.

Solution:

(i) No. of moles of $H_2O = \frac{wt}{mwt} = \frac{360}{18} = 20$;
(ii) Number of moles of $N_2 = \frac{5.6}{28} = 0.2$;
(iii) Number of moles of NaOH = $\frac{4}{40} = 0.1$.

Question-3

Calculate the number of moles of H_2SO_4 present in 50 ml of 0.2m H_2SO_4.

Solution:

0.2m means it contains 0.2 moles per litre.
1000 ml contains 0.2 moles at H_2SO_4
$\therefore$50 ml contains = $\frac{0.2}{1000} \times 50 = \frac{2 \times 10^{-1} \times 50}{10^3} = 10 \times 10^{-2} = 0.01$ moles.

Question-4

What is molarity of a solution contain 5.84 gms of NaCl in 200 ml of solution?

Solution:

Number of moles of NaCl = $\frac{wt}{m.wt} = \frac{5.84}{58.48} = 0.1$

Molarity = $\frac{moles}{litre}$

Volume of solution in litre = $\frac{200}{1000} = 0.2$

$\therefore$ Molarity of the solution = $\frac{0.1}{0.2} = \frac{1 \times 10^{-1}}{2 \times 10^{-1}} = 0.5m.$

Question-5

What is weight of NaOH present in 250 cc of a 2M solution?

Solution:

2M of NaOH solution means it contains 2 moles of NaOH per litre

1000ml = 2 moles of NaOH

Number of moles of NaOH present in 250cc = $\frac{2}{1000} \times 250 = \frac{2}{4} = 0.5$

Mole = $\frac{wt}{m.wt}$; wt = mole x m.wt

$\therefore$ Weight of NaOH present in 250 ml of solution = 0.5 x 40 = 20 gm.

/ Through Formula /

Weight of substance in 1 lit solution = Molarity x m.wt

Weight of NaOH present in 1 lit solution $\downarrow$ = 2 x 40 gms

$\therefore$ Weight of NaOH present in 250cc solution = $\frac{2 \times 40 \times 250}{1000}$ = 20 gms.

Question-6

In a reaction vessel 0.980 gm of H_2SO_4 is required to be added for completing the reaction. How many millilitre of 0.05 M H_2SO_4 solution should be added for this requirement?

Solution:

0.05 M H_2SO_4 means 0.05 moles of H_2SO_4 pressure in 1000 ml;

1 litre of 0.05 m H_2SO_4 contains = molarity x m.wt = 0.05 x 98 = 5×10^{-2} x98 = 4.9 gms of H_2SO_4

$\therefore$1 ml contains = $\frac{4.9}{1000}$ = 4.9×10^{-3} gms of H_2SO_4

4.9×10^{-3} of gms of H_2SO_4 = 1 ml of solution

$\therefore$0.980 gms of H_2SO_4 = $\frac{1}{4.9 \times 10^{-3}} \times 0.980 = \frac{98 \times 10^{-2}}{49 \times 10^{-4}} = 2 \times 10^2 = 200$ ml.

Through formula :

Wt. of H_2SO_4 present in 1 lt = Molarity x m.wt

Wt.of H_2SO_4 present in 1 lt of 0.05M = 0.05 x 98 gm = $98 \times 5 \times 10^{-2}$ gms = 4.9 gms.

$\therefore$4.9 gms is present in 1000 ml

Hence, 0.980 gms is present in $\frac{1000}{4.9} \times 0.98$

$$= \frac{1000 \times 98 \times 10^{-2}}{49 \times 10^{-1}}$$

= 200 ml.

Question-7

How much AgCl will be formed by adding 200ml of 5M HCl to the solution containing 1.7 gms of Ag No_3?

Solution:

$AgNO3 + HCl \rightarrow AgCl \downarrow + HNO3$

200 ml of 5M HCl contains 1.7g of AgNO3

$\therefore$1000 ml of 1M HCl will contain $-\frac{1.7 \times 1000}{200 \times 5}$ = 1.7g

Hence 1M solution of HCl contains 1.7 g of AgNO3.

Question-8

Calculate the weight of HCl in 10 ml of con. HCl of density 1.2 gm L^{-1} container 35% HCl by weight. What is the molarity of the solution?

Solution:

35% HCl means 35 gm of HCl are present in 100 gms of HCl solution.

$\therefore$ Volume of 100 gms of given HCl solution = $\frac{\text{mass}}{\text{density}} = \frac{100}{1.2} = 83.3$ ml

83.3 ml of con. HCl contains 35 gms of HCl

$\therefore$ 10 ml of con. HCl contains $\frac{35}{83.3} \times 10 = \frac{350}{83.3} = 4.20$ gms of HCl.

Molarity of the solution = $\left(\frac{wt}{mwt}\right) \times \frac{1000}{10}$ (in litre)

$= \frac{4.2}{36.45} \times \frac{1000}{10}$

$= \frac{420}{36.45} = 1.15$ M.

Question-9

The molarity of con. HCl is 1.15M; what volume of con. HCl is required to make 1.00 of 0.1M HCl.

Solution:

Known Unknown

$V_1 M_1 = V_2 M_2$

1000 ml x 0.1M = V_2 x 1.15M

$V_2 = \frac{1000 \times 0.1}{1.15}$ ml = $\frac{100}{1.15} = \frac{100 \times 10^2}{115} = 86.9$ ml.

Question-10

Aluminium and Sulphuric acid react according to the reaction :

$$2Al+3H_2SO_{4(aq)} \rightarrow Al_2(SO_4)_{3(aq)}+3H_2(g)$$

If 0.5 mol Al are added to H_2SO_4 solution containing 0.2 mole H_2SO_4 , how many moles of H_2 are produced.

Solution:

As per equation, 2 moles Al reacts with 3 moles of H_2SO_4 to produce 3 mole of H_2.

$\therefore$ 0.5 ml Al reacts with 3 mole of H_2SO_4 $\frac{3}{0.5}$ moles of H_2.

$\therefore$ 0.5 ml of Al reacts with 0.2 mole of H_2SO_4 = $\frac{3}{0.5} \times \frac{1}{3} \times 0.2$ mole of H_2

= $\frac{0.2}{0.5}$ moles of H_2

= $\frac{2}{5}$ = 0.4 moles of H_2.