# Mole and Equivalent Concept

**Q.1.** The number of years it would take to spend Avogadro's number of rupees at

the rate of 10 lakh rupees per second is :

(A) $2.5 \times 10^{10}$     (B) $2.3 \times 10^{10}$     (C) $2.1 \times 10^{10}$ (D) $1.9 \times 10^{10}$.

**Q.2.** A plant virus is found to consist of uniform cylindrical particles of 150 Å in

diameter and 5000Å long. The specific volume of the virus is 0.75 $cm^3$/g. If the

virus is considered to be a single particle, its molecular weight is :

(A) $7.095 \times 10^6$                                            (B) $7.095 \times 10^7$

(C) $7.095 \times 10^8$                                            (D) $7.095 \times 10^9$.

**Q.3.** The vapour density of a mixture containing $NO_2$ and $N_2O_4$ is 38.3 at 27º C.

The mole of $NO_2$ in 100 g mixture is :

(A) 0.437           (B) 0.436           (C) 0.435           (D) 0.434.

**Q.4.** The molecules of methane, C and H atoms in 25 g of methane are in ratio of :

(A) 1: 2: 3          (B) 1: 2: 4          (C) 1: 1: 4          (D) 1: 1: 3.

$3.764 \times 10^{24}$ = 1 : 1 : 4.        (C) [**Ans.**]

**Q.5.** The number of oxalic acid molecules in 100 mL of 0.02N oxalic acid is :

(A) $6.023 \times 10^{23}$                    (B) $6.023 \times 10^{22}$                    (C) $6.023 \times 10^{21}$          (D) $6.023 \times 10^{20}$

**Q.6.** The weight of iron which will be converted into its oxide by the action of 18 g

of steam is :     (A) 40 g               (B) 41 g               (C) 42 g               (D) 43 g.

**Q.7.** The weight of one litre sample of ozonised oxygen at NTP was found to be

1.5 g. When 100 mL of this mixture at NTP were treated with terpentine oil, the

volume was reduced to 90 mL. The molecular weight of ozone is:

(A) 48.0

(B) 48.1

(C) 48.2

(D) 48.3.

**Q.8.** The amount of calcium oxide required when it reacts with 852 g of $P_4O_{10}$ is :

(A) 1008 g          (B) 852 g          (B) 504 g          (D) 284 g.

**Q.9.** The millilitre of 0.5 M $H_2SO_4$ needed to dissolve 0.5 g of copper II carbonate is:

(A) 8.000 mL

(B) 8.007 mL

(C) 8.009 mL

(D) 8.097 mL.

**.10.** The formula weight of an acid is 82.0. 100 $cm^3$ of a solution of this acid containing 39.0 g of the acid per litre were completely neutralized by 95.0 $cm^3$ of aqueous NaOH containing 40.0 g of NaOH per litre. The basicity of the acid is :

(A) 1                    (B) 2                    (C) 3                    (D) 0.

**Q.11.** Volume at NTP of ammonia gas required to be passed into 30 mL of N $H_2SO_4$ solution to bring down the acid normality to 0.2 N is :

(A) 537.4 mL          (B) 537.5 mL          (C) 537.6 mL          (D) 537.7 mL.

**Q.12.** The volume of a solution of hydrochloric acid containing 73 g of acid per litre required for the exact neutralization of sodium hydroxide obtained by allowing 0.46 g of metallic sodium to act upon water is :

(A) 10 mL          (B) 18 mL                    (C) 23 mL          (D) 36.5 mL.

**Q.13.** Upon mixing 45.0 mL of 0.25 M lead nitrate solution with 25 mL of 0.10 M chromic sulphate. The number of mole of lead sulphate formed is :

(A) 0.0065      (B) 0.0070      (C) 0.0075      (D) 0.0080.

**Q.14.** 20% surface sites have absorbed $N_2$. On heating $N_2$ gas is evolved from sites and were collected at 0.001 atm and 298 K in a container of volume 2.46 $cm^3$. Density of surface sites is $6.023 \times 10^{14}$ $cm^{-2}$ and surface area is 1000 $cm^2$. The number of surface sites occupied per molecule of $N_2$ is :

         (A) 1          (B) 2          (C) 3          (D) 4.

**Q.15.** 1 g of charcoal adsorbs 100 mL of 0.5 M $CH_3COOH$ to form a monolayer of and thereb the molarity of $CH_3COOH$ reduces to 0.49. Surface area of charcoal is $3.01 \times 10^2$ $m^2$ / g. Then the surface area of the charcoal adsorbed by each molecule of acetic acid is :

(A) $5 \times 10^{-19}$          (B) $6 \times 10^{-19}$          (C) $7 \times 10^{-19}$          (D) $8 \times 10^{-19}$.

**Q.16.** The molarity of 1 litre solution of 93% $H_2SO_4$ by volume, if the density of the solution is 1.84 $mL^{-1}$, is :

(A) 11.02          (B) 10.52          (C) 10.42          (D) 10.02.

**Q.17.** The density of water is 1000 $kg/m^3$, its molarity is :

(A) 55.50          (B) 55.05          (C) 55.06          (D) 55.60.

**Q.18.** A mixture of Al and Zn weighing 1.67 g is completely dissolved in acid and evolved 1.69 litre of $H_2$ at NTP. The weight of Al in original mixture is :

(A) 1.25 g          (B) 1.15 g          (C) 1.05 g          (D) 1.00 g.

**Q.19.** A mixture of HCOOH and $H_2C_2O_4$ is heated with conc. $H_2SO_4$. The gas produced is collected and on treating with KOH solution the volume of the gas decreases by $1/6^{th}$. The molar ratio of two acids in original mixture is :

(A) 2: 1

(B) 4: 1

(C) 4: 3

(D) 3: 4.

**Q.20.** A sample of Mg was burnt in air to give a mixture of MgO and $Mg_3N_2$. The ash was dissolved in 60 Meq. of HCl and the resulting solution was back titrated with NaOH. 12 Meq. of NaOH were required to reach the end point. An excess of NaOH was added and the solution distilled. The ammonia released was then trapped in 10 Meq. of second acid solution. Back titration of this solution required 6 Meq. of the base. The percentage of Mg burnt to the nitride is :

(A) 20.27 %

(B) 24.27 %

(C) 27 %

(D) 27.27 %.

**Q.21.** For the reaction, $N_2O_5$ (g) $\leftrightarrow$ 2NO$_2$ (g) + 0.5 O$_2$ (g), the mole fraction of $N_2O_5$ (g) decomposed at a constant volume and temperature, if the initial pressure is 600 mm Hg and the pressure at any time is 960 mm Hg, assuming ideal gas behavior, is :

(A) 2/5      (B) 5/2      (C) 0.4      (D) 2.5.

**Q.22.** A gas mixture of 3 litre of propane ($C_3H_8$) and butane ($C_4H_{10}$) on complete combustion at 25º C produced 10 litre $CO_2$. The composition of gas mixture is :

(A) 2 lit & 2 lit                 (B) 2 lit & 1 lit

(C) 1 lit & 2 lit                 (D) 2 lit & 3 lit.

**Q.23.** A mixture in which the mole ratio of $H_2$ and $O_2$ is 2: 1 is used to prepare

water by the reaction,

$$2H_2 \text{ (g)} \quad + \quad O_2 \text{ (g)} \rightarrow \quad 2H_2O \text{ (g)}$$

The total pressure in the container is 0.8 atm at 20º C before the reaction. The final pressure at 120º C after reaction assuming 80 % yield of water is :

(A) more than 0.8 atm      (B) 0.8 atm

(C) less than 0.8 atm (D) no pressure.

**Q.24.** 5 g of a solid mixture containing a g lead nitrate and b g sodium nitrate was heated below 600º C until weight of residue was constant. If the loss in weight is 28%, then:

(A) a = b          (B) a < b          (C) a > b          (D) none of the above.

**Q.25.** A mixture of ethane ($C_2H_6$) and ethene ($C_2H_4$) occupies 40 litre at 1 atm and 400 K. The mixture reacts completely with 130 g of oxygen to produce carbon dioxide gas and water vapour. Assuming ideal gas behavior, the mole fraction of $C_2H_4$ and $C_2H_6$ in the mixture is :

(A) 0.34; 0.66                                    (B) 0.66; 0.34                                    (C) 0.5; 0.5

(D) 0.6; 0.4.

**Q.26.** A sample containing 0.4775 g of $(NH_4)_2C_2O_4$ and inert materials was dissolved in water and made strongly alkaline with KOH, which converted $NH_4$ to $NH_3$ The liberated ammonia was distilled into exactly 50.0.mL of 0.05035 M $H_2SO_4$. The excess $H_2SO_4$ was back titrated with 11.3 mL of 0.1214 M NaOH. [Molecular wt. of $(NH_4)_2C_2O_4$ = 124.10 and atomic wt. of N = 14.0078] The percent of N and per cent of $(NH_4)_2C_2O_4$ are :

(A) 10% & 47%                                      (B) 11% & 45%

(C) 10.74% & 47.80%                         (D) 12% & 46%.

**Q.27.** 1.20 g sample of $Na_2CO_3$ and $K_2CO_3$ is dissolved in water to form 100 mL of a solution. 20 mL of this solution required 40 mL of 0.1 N HCl for complete neutralization. The weight of $Na_2CO_3$ in the mixture is :

    (A) more than 0.60 g (B) exactly 0.60 g

  (C) less than 0.60 g     (D) none of the above.

**Q.28.** 1.20 g sample of $Na_2CO_3$ and $K_2CO_3$ is dissolved in water to form 100 mL of a solution. 20 mL of this solution is treated with excess of $BaCl_2$. The weight of precipitate is :

            (A) 0.391 g      (B) 0.392 g      (C) 0.393  g    (D) 0.394 g.

**Q.29.** 25 mL of a solution of $Na_2CO_3$ having a specific gravity of 1.25 g mL$^{-1}$ required 32.9 mL of a solution of HCl containing 109.5 g of the acid per litre for complete neutralization. The volume of 0.84 N $H_2SO_4$ that will be completely neutralized by 125 g of $Na_2CO_3$ solution is :

(A) 450 mL

(B) 460 mL

(C) 470 mL

(D) 480 mL.