Some Basic Concepts of Chemistry.

Molecular Weight =

NaCl – $23 + 35.5 = 58.5$

Atomicity H_2SO_4 – 7

Mole Concept –

1 mole – N_A – 6.023×10^{23}

GIAM, GIMM :

GIAM of Oxygen = mass of 1 g atom of Oxygen

= mass of 1 mole atom of Oxygen

$= \left(\frac{16}{N_A} g \times N_A\right) = 16 g$

GIMM of H_2SO_4 $= \frac{98}{N_A} \times N_A = 98 g$

formula:

$$\text{Mole} = \frac{\text{weight}}{M_w}$$

✓ $$\text{Mole of molecules} = \frac{\text{weight}}{GIMW}$$

Mole atoms = atomicity × mole molecules

given Volume (…

Mole of gas $= \frac{\text{given Volume}}{22.4}$ (STP)

Mole Particles $= \frac{\text{No. of Particles}}{N_A}$

Cal. the no. of molecules and atoms present in 2g of nitrogen? [N = 14]

No. of moles $= \frac{2}{28} = 1/14$

No. of molecules (N) $= 1/14 \times N_A$

No. of atoms $= 2 \times \frac{N_A}{14} = \frac{N_A}{7}$ atoms

Vapour density is Unitless

Relative density $= \frac{\text{density of gas A}}{\text{density of gas B}}$.

Specific gravity $= \frac{\text{Density of Solution}}{\text{Density of water}}$.

$(N_2)_x \Rightarrow$ V.P 70

$x = ?$

Mol. wt $= 2 \times$ V.P

$= 2 \times 70 = 140$

$140 = x \times 28$

$x = 5$

$140 = x \times ...$

$\boxed{x = 5}$

$$\%\,mass = \frac{No.\ of\ atoms \times at.\ mass}{MM} \times 100$$

$$n = \frac{M.F}{Em.F}$$

Eg: $\boxed{MM = 92}$

		At. weight	$\frac{\%}{At.\ we}$	Simplest ratio
Carbon	52.2%	12	$\frac{52.2}{12} = 4.4$	$\frac{4.4}{2.2} = 2$
Hydrogen	13%	1	$\frac{13}{1} = 13$	$\frac{13}{2.2} = 5.9$
Oxygen	34.8%	16	$\frac{34.8}{16} = 2.2$	$\frac{2.2}{2.2} = 1$

$C_2H_6O \Rightarrow$ Empirical formula.

Em. formula mass $= 12 \times 2 + 1 \times 6 + 16 \times 1 = 46$

$$\frac{92}{46} = 2$$

$M.F = 2(em.F) = 2 \times C_2H_6O = C_4H_{12}O_2$

For Complete Combustion of 3g ethane. find required moles of O_2 and formed moles of CO_2 Volume of O_2 & CO_2 at STP.

Mass

$2C_2H_6 + 7O_2 \longrightarrow 4CO_2 + 6H_2O$

Mass-Volume

$2C_2H_6 + 7O_2 \longrightarrow 4CO_2 + 6H_2O$

no. of moles $= \frac{3}{30}$ (Mw of ethane) $= \frac{1}{10} = 0.1$

2 7
0.1 x
$\frac{0.1 \times 7}{2}$ (3.5)

Required mole of O_2 = 0.35 moles

Volume of O_2 = 0.35×22.4
= 7.84 L

2 4
0.1 x
$\frac{0.1 \times 4}{2}$ (2)

Produced moles of CO_2 = 0.2 moles

Volume of CO_2 = 0.2×22.4
= 4.48 L

L.R ⇒ which will get consumed first

Type-I Mass-Mass

How much iron can be ther. obtained in the reduction of 1 kg of Fe_2O_3? M.W = 160 g/mol.

$Fe_2O_3 + 3H_2 \longrightarrow 2Fe + 3H_2O$.

$n_{Fe_2O_3} = \frac{1000}{160} = \frac{100}{16}$ mol.

no. of Fe $= 2 \times \frac{100}{16} = \frac{100}{8}$ mol. = 12.5 mol

weight = no. of moles × M.W

= 12.5×56 = 700 g = 0.7 kg

weight = no. of moles × M.M.

= 12.5 × 56 = 700 g = 0.7 kg

Type-II Mass-Vol.

III

100 mL N_2 100 mL of H_2 mixed together to form NH_3. Volume of NH_3 Produced.

$$\boxed{1}N_2 + \boxed{3}H_2 \rightarrow \boxed{2}NH_3$$

100 mL 100 mL

$\frac{100}{1} = 100$ $\frac{100}{3} = 33.3$ → L.R.

3 2

100

For 100 mL of H_2, Producing $NH_3 = \frac{100 \times 2}{3}$

$= 66.6$ mL.

Equivalent weight = $\frac{\text{At. weight}}{\text{Valency factor}}$.

Conc. Terms:

Molarity (M) = $\frac{\text{No. of moles of Solute}}{\text{Volume of Solution (L)}}$

Molality (m) = $\frac{\text{No. of moles of Solute}}{\text{weight of Solvent (kg)}}$

weight of solvent (kg)

$$\text{Normality (N)} = \frac{\text{Mass of Solute (g)}}{\text{Equivalent mass} \times \text{Vol. of Solution (L)}}$$

$$\text{Mole fraction } X_A = \frac{\text{moles of Solute (A)}}{\text{moles of Solute (A)} + \text{moles of Solvent (B)}}$$

$$X_B = \frac{\text{moles of Solvent (B)}}{\text{moles of Solute (A)} + \text{moles of Solvent (B)}}$$

$$\boxed{X_A + X_B = 1}$$

6.02×10^{23} molecules of urea are dissolved in 1L of water. Cal. molarity (M) of Sln if 40% of urea undergo dimerisation.

$$2CO(NH_2)_2 \longrightarrow (CO(NH_2)_2)_2$$

a) 0.6 M b) 0.7M c) 0.8M d) 0.9M.

Initial Molecules $= 6.02 \times 10^{23}$

40% of Urea dimn.

dimn molecule $= 0.4 \times 6.02 \times 10^{23} / 2$

remaining $= 0.6 \times 6.02 \times 10^{23}$

Total molecule after dimerisation

$= 0.6 N_A + 0.2 N_A = 0.8 N_A$

$$\text{Molarity} = \frac{0.8 \text{ moles}}{1 (L)} = 0.8 \text{ molarity}$$

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$$0.8M$$