# SOME BASIC CONCEPT OF CHEMISTRY FORMULAS





## 1. SOME BASIC CONCEPTS OF CHEMISTRY

$1\text{Å} = 10^{-10}$ m, 1 nm $= 10^{-9}$ m
1pm $= 10^{-12}$ m
1 litre $= 10^{-3}$ m$^3$ $= 1\text{dm}^3$
1 atm = 760 mm or torr
= 101325 Pa or Nm$^{-2}$
1 bar $= 10^5 \text{Nm}^{-2} = 10^5$ Pa
1 calorie = 4.184 J
1 electron volt (eV) = $1.6022 \times 10^{-19}$ J
(1 J = $10^7$ ergs)
$(1\text{cal} > 1\text{ J} > 1erg > 1eV)$

**Substance : (Matter)**

| Substance | | | | |
|---|---|---|---|---|
| Physical Classification | Chemical classification | | | |
| - Solid<br>- Liquid<br>- Gas | Pure substance | | Impure substance | |
| | Element | compound | Mixture | |
| | - Metal<br>- Non mental<br>- metlliod | | Homogenous | Heterogenous |
| | | | Solutions | - Colloid<br>- suspension |

## DEFINITION OF MOLE

One mole is a collection of that many entities as there are number of atoms exactly in 12 gm of C-12 isotope.

(1). Number of molecules in W(g) of substance $= \frac{W(g) \times N_A}{GMM}$

(2). Molarity (M) : Moles of solute in one lit solution $= \frac{\text{moles of solute}}{\text{vol. of solution in lit}} = \frac{w \times 1000}{M^0 \times V(ml)}$ (where $M^\circ$ is molar mass of solute) Molarity × volume of solution in lit = moles of solute

(3)

$$\text{Molality (m)} = \text{Moles of solute per kg of solvent} = \frac{\text{Moles of solute}}{\text{Weight of solvent (kg)}} = \frac{w \times 1000}{M^0 \times w'}$$

$$\text{Molality (m)} = \frac{\text{No. of moles of solute}}{\text{Mass of solvent in kg}}$$

(4). Number of molecules in V litre of gas at S.T.P. $= \frac{VN_A}{22.4}$

(5). Number of gram atoms $= \frac{W(g)}{GAM}$ (GAM → gram atomic mass )

(6). Number of gram molecules $= \frac{W(g)}{\text{Gram molecular mass}}$

(7). Dilution formula: $M_1V_1 = M_2V_2$

For mixing two solutions of the same substance

$M_1V_1 + M_2V_2 = M_3(V_1 + V_2)$

Molarity can be directly calculated from % by mass ( w/w ) if density is known

Molarity $= \frac{\%\times 10\times d}{GMM}$

(8). Mass of 1 atom of element $= \frac{GAM}{N_A}$

(9). Mass of 1 molecule of substance $= \frac{MM}{N_A}$ (MM → Molar mass )

(10). $T(K) = T(^\circ C) + 273.15$

(11). Relative atomic mass $= \frac{\text{Mass of an atom of the element}}{\frac{1}{12}\times \text{Mass of an atom of carbon (C-12)}}$

(12). Number of molecules in n moles of substance $= n \times N_A$

(13). Mass % of an element in a compound $= \frac{\text{Mass of that element in 1 mole of the compound}}{\text{Molar mass of the compound}} \times 100$

(14). Mass percent $= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$

(15). $\frac{X_B}{1-X_B} = \frac{\text{molality}\times M_A}{1000}$ where $M_A$ - mass of solvent

(16). Normality (N) : No. of equivalent of solute per litre of solution.

$$= \frac{\text{g.eq.of solute}}{\text{vol.of solution in lit}} = \frac{w\times 1000}{E\times V(ml)}$$

$\Rightarrow$ [Normality $\times$ volume in lit = g.eq. of solute]

$\Rightarrow$ [Normality = Molarity $\times$ n - factor ]

(17) Molarity (M) $= \frac{\text{No. of moles of solute}}{\text{Volume of solution in litres}}$ mole /L

(18). Avogadro's No. $N_A = 6.022\times 10^{23}$

(19). $T(^\circ F) = \frac{9}{5}T(^\circ C) + 32$

- **For Ionic Compounds**

  1 g formula unit = 1 mole of formula unit = NA formula unit.

  g formula mass (GFM) = mass of NA formula unit in g.

  Mole of formula unit = $\frac{\text{Mass(g)}}{\text{GMM or molar mass}}$

- **VAPOUR DENSITY**

  Ratio of density of vapour to the density of hydrogen at similar pressure and temperature

  Vapour density = $\frac{\text{molar mass}}{2}$

  Molecular mass = 2 $\times$ vapour density

  Mole fraction of A = $\frac{\text{No. of moles of A}}{\text{No. of moles of solution}}$