ATOMS AND MOLECULES

Molecular Mass

Molecular mass and formula mass:

The molecular mass of a substance (an element or a compound) may be defined as the average relative mass of a molecule of the substance as compared with mass of an atom of carbon (C-12 isotope) taken as 12 amu.

$$\text{Molecular Mass} = \frac{\text{Mass of 1 molecule of the substance}}{\text{1/ 12 of mass of an atoms of C -12}}$$

The molecular mass of a compound can be obtained by adding atomic masses of all the atoms present in the molecule of the compound. For example, molecular mass of CO_2 is -

$$12 \times 1 + 16 \times 2 = 44 \text{ u}$$

Gram Molecular Mass:

Gram molecular mass of a substance is defined as that much quantity of the substance whose mass expressed in grams is numerically equal to its molecular mass.

For example: The molecular mass of CO_2 is 44 u, its gram molecular mass is 44g. Gram molecule mass of a substance is also known as gram-molecular mass of the substance.

Formula Mass:

Formula mass of an ionic compound is obtained by adding atomic masses of all the atoms in a formula unit of the compound.

For example:

Formula mass of potassium chloride (KCl)= Atomic mass of potassium + atomic mass of chlorine

$$39 + 35.5 = 74.5$$

Q. Calculate the molecular masses of $H_2, O_2, Cl_2, CO_2, CH_4, C_2H_6, C_2H_4, NH_3, CH_3OH$. **[NCERT]**

Q. Calculate the formula unit masses of ZnO, Na_2O, K_2CO_3, given atomic masses of Zn=65u,Na=23u, K = 39 u, C = 12 u and O = 16 u **[NCERT]**

Q. Calculate the molar mass of the following substances. **[NCERT]**

(a) Ethyne, C_2H_2

(b) Sulphur molecule, S_8

(c) Phosphorous molecule, P_4(Atomic mass of phosphorus = 31)

(d) Hydrochloric acid, HCl

(e) Nitric acid, HNO_3