

CLASS IX :MOLECULAR MASS AND MOLE CONCEPT.

Molecular mass. The molecular mass of a substance is the sum of the atomic masses of all the atoms in a molecule of the substance. It is the relative mass of a molecule expressed in atomic mass units (u).

FORMULA UNIT MASS: The formula unit mass of a substance is a sum of the atomic masses of all atoms in a formula unit of a compound. Formula unit mass is calculated in the same manner as we calculate the molecular mass. The word formula unit IS used for those substances whose constituent particles are ions.

Eg; Sodium chloride (NaCl). Its formula unit mass can be calculated as– $1 \times 23 + 1 \times 35.5 = 58.5 \text{ u}$

One mole: One mole of any species (atoms molecules, ions or particles) is that quantity in number having a mass equal to its atomic or molecular mass in grams.

Avogadro Number (N_0): The number of particles (atoms, molecules or ions) present in 1 mole of any substance is fixed, with a value of 6.022×10^{23} . This number is called the **Avogadro Constant** or **Avogadro Number**.

1 mole (of anything) = 6.022×10^{23} in number

Molar Mass: Mass of 1 mole of a substance is called its molar mass .

Gram Atomic Mass (GAM) : mass of 1 mole of a particular substance is fixed. The mass of 1 mole of a substance is equal to its relative atomic or molecular mass in grams.

Atomic mass of an atom expressed in gram is called Gram atomic mass.

Eg: . atomic mass of hydrogen=1u.

Gram atomic mass of hydrogen = 1 g.

(1 u hydrogen has only 1 atom of hydrogen 1 g hydrogen has 1 mole atoms, that is, 6.022×10^{23} atoms of hydrogen)

16 u oxygen has only 1 atom of oxygen, 16 g oxygen has 1 mole atoms, that is, 6.022×10^{23} atoms of oxygen

Gram Molecular Mass(GMM) : The molecular mass of a molecule express in gram is called its Gram Molecular Mass.

Eg: molecular mass of water (H_2O) is 18 u.

Gram Molecular Mass of Water is 18g

18 u water has only 1 molecule of water, 18 g water has 1 mole molecules of water, that is, 6.022×10^{23} molecules of water.

A mole is the chemist's counting unit. Chemists need the number of atoms and molecules while carrying out reactions, and for this they need to relate the mass in grams to the number. It is done as follows: 1 mole = 6.022×10^{23} number = Relative mass in grams

Calculating the number of moles (n) from given mass and Molar mass

$$n = \frac{m}{M} = \frac{\textit{given mass}}{\textit{Molar mass}}$$

Calculating the number of moles(n) from given number of particles / atoms and Avogadro Number

$$n = \frac{N}{N_0} = \frac{\textit{given number of particles}}{\textit{Avogadro Number}}$$