

9th Class

➤ Moles Concept:

❖ Definition:

- A mole is a unit of measurement used in chemistry to express amounts of a chemical substance.
- One mole (mol) is defined as the amount of substance that contains the same number of entities (atoms, molecules, ions, etc.) as there are in 12 grams of carbon-12. This number is known as Avogadro's number (approximately 6.022×10^{23}).

❖ Avogadro's Number:

- Avogadro's number represents the number of particles (atoms, ions, or molecules) in one mole of a substance.
- $1 \text{ mol} = 6.022 \times 10^{23}$ entities (Avogadro's number).

❖ Molar Mass:

- The molar mass of a substance is the mass (in grams) of one mole of that substance.
- It is expressed in units of grams/mol.
- The molar mass of an element is numerically equal to its atomic mass in atomic mass units (u).

❖ Calculation of Moles, Mass, and Number of Particles:

1. Moles (n):

- $n = \text{Mass} / \text{Molar Mass}$
- $n = \text{Number of Particles} / \text{Avogadro's Number}$

2. Mass (m):

- $M = n \times \text{Molar Mass}$

3. Number of Particles (N):

- $N = n \times \text{Avogadro's Number}$

❖ Relationships Between Moles and Volume:

1. **Molar Volume of a Gas at Standard Temperature and Pressure (STP):**

- At STP (0°C and 1 atm pressure), one mole of any gas occupies a volume of 22.4 liters.

❖ **Applications:**

1. **Stoichiometry:**

- The mole concept is crucial for stoichiometry, which involves the quantitative relationships between reactants and products in chemical reactions.

2. **Chemical Equations:**

- Balancing chemical equations involves a consideration of moles to ensure the conservation of mass.

3. **Limiting Reactant:**

- Determining the limiting reactant in a chemical reaction involves comparing the amounts of reactants in moles.

4. **Concentration of Solutions:**

- Molarity (moles of solute per liter of solution) is a unit of concentration that relies on the moles concept.