The Language of Chemistry

- The size of an atom is indicated by the radius of the atom called the **atomic radius**. It is often expressed in **nanometers.**
- **Representation of atoms**
  - The symbol of the element is made from one or two letters of the English or the Latin name of the element.
  - Symbols are significant as they represent a particular element and they represent one atom of that element.
- **Atomic Mass**
  - The mass of an atom is known as the atomic mass**.**
  - The atomic mass of an atom of an element is also known as its relative atomic mass, since it is determined relative to the mass of C-12 isotope.

- **Gram molecular mass:** The mass of one mole of atoms is known as the **molar mass of atoms**, **gram atomic mass**, or **gram atoms**. For example, the atomic mass of nitrogen is 14 u and the gram atomic mass of nitrogen is 14 g. The mass of one mole molecules of any substance is equal to the **gram molecular mass** of that substance.
- **Relative atomic mass or atomic weight:** It is the ratio of mass of one atom of an element to the mass of an atom of hydrogen taken as unity.
- **Gram molecular volume:** The volume occupied by 1 gram molecule of a dry gas at S.T.P is called gram molecular volume. The experimental value of 1 gram molecular volume of a gas is 22.4 L at S.T.P.

- Valency is defined as the combining capacity of the atom of an element. Valency of an element depends upon the number of electrons present in the outermost shell of its atom.
- The combining capacity of an element is known as its **valency**.
- It has been observed that certain metals exhibit more than one valency. In such a situation, metals are said to exhibit variable valency.

- **Chemical formula**

- A chemical formula is the representation of the composition of a molecule in terms of the symbols of elements present in that molecule.
- **Molecular formula** is a **chemical formula** that indicates the kinds of atoms and the numbers of each kind of atom in a molecule of a compound.

- To write the chemical formula of a compound, one should have prior knowledge of two things.

  - **The symbols of the constituent elements.**
  - **The combining capacity of the atom of each element constituting the compound.**

1 mole of any substance can be defined as:

- Amount of a substance that contains as many particles (atoms, molecules or ions) as there are atoms in 12 g of the ^{12}C isotope

- Avogadro number or Avogadro constant (N_A); equal to 6.022×10^{23} particles

Percentage Composition

$$\text{Mass percent of an element} = \frac{\text{Mass of that element in the compound} \times 100\%}{\text{Molar mass of the compound}}$$

Empirical formula and molecular formula:

Empirical formula	Molecular formula
Represents the simplest whole number ratio of various atoms present in a compound	Represents the exact number of different types of atoms present in a molecule of a compound

- In a chemical reaction, at least one of the following will occur:
- Change in state
- Change in colour
- Evolution of a gas
- Change in temperature

- Formation of a precipitate

A **chemical equation** is the symbolic representation of a chemical reaction in the form of chemical formulae, signs, symbols, and directions. In which the reactant entities are given on the left-hand side and the product entities on the right-hand side.

- **Balanced chemical equation**

Reactants → Products

LHS   RHS

Total number of atoms on the LHS = Total number of atoms on the RHS

- How to balance an equation
- Write reactants and products
- Balance the maximum number of a particular atom on both sides
- Balance other atoms
- A complete balanced equation should look like

$$CO \ g + 2H_2 \ g \xrightarrow{340 \ atm} CH_3OH \ l$$