Chapter 3: Atoms and Molecules – Notes

🔍 Key Concepts

1. Laws of Chemical Combination

- **Law of Conservation of Mass**: Mass can neither be created nor destroyed in a chemical reaction.
- **Law of Constant Proportions**: A chemical compound always contains the same elements in a fixed ratio by mass.

2. Dalton's Atomic Theory

- All matter is made of indivisible particles called atoms.
- Atoms of a given element are identical in mass and properties.
- Atoms combine in simple whole-number ratios to form compounds.
- Atoms can neither be created nor destroyed in a chemical reaction.

3. Atoms

- The smallest unit of an element that takes part in a chemical reaction.
- Examples:
  - Hydrogen (H)
  - Oxygen (O)
  - Carbon (C)

4. Molecules

- A molecule is a group of two or more atoms chemically bonded together.
- **Molecules of elements**: O_2, N_2, H_2
- **Molecules of compounds**: H_2O, CO_2, NH_3

5. Atomicity

- The number of atoms in a molecule.
  - Monoatomic: He, Ne
  - Diatomic: O_2, N_2
  - Triatomic: O_3
  - Polyatomic: P_4, S_8

6. Ions

- **Cations**: Positively charged ions (e.g., Na^+, Ca^{2+})
- **Anions**: Negatively charged ions (e.g., Cl^-, SO_4^{2-})

7. Chemical Formulae

- Represents the composition of a molecule.
- Example: Water – H_2O, Carbon dioxide – CO_2
- **Rules**:
    - The valency of each element is used to write formulae.
    - Criss-cross method can help in determining formulas.

8. Molecular Mass

- The sum of atomic masses of all atoms in a molecule.
- Formula:

  $$\text{Molecular Mass} = \sum \text{Atomic Mass of each atom}$$

9. Mole Concept

- **1 mole** = 6.022×10^{23} particles (Avogadro's number)
- **Molar Mass** = Mass of 1 mole of a substance (in grams)
- Relationship:

  $$\text{Number of moles} = \text{Given mass} / \text{Molar mass}$$

📝 Important Formulae and Definitions

Term	Formula
Molecular Mass	Sum of atomic masses
Moles	Given mass / Molar mass
No. of Particles	Moles × Avogadro's number

📌 Key Points to Remember

- Atoms are the building blocks of matter.
- Compounds are formed by the chemical combination of elements.
- Mole concept helps in quantitative chemical calculations.
- Chemical reactions follow fixed laws.