

9th Class

➤ **Molecules:**

Definition:

- A molecule is the smallest unit of a chemical compound that retains the chemical properties of that compound.
- It consists of two or more atoms chemically bonded together.

Types of Molecules:

1. **Molecular Compounds:**

- These are compounds composed of molecules.
- The atoms in molecular compounds are held together by covalent bonds.
- Examples include water (H₂O), methane (CH₄), and carbon dioxide (CO₂).

2. **Diatomic Molecules:**

- Some elements naturally exist as diatomic molecules (molecules consisting of two atoms of the same element).
- Examples include oxygen (O₂), nitrogen (N₂), and hydrogen (H₂).

3. **Polyatomic Molecules:**

- Molecules containing more than two atoms of different elements are called polyatomic molecules.
- Examples include ozone (O₃) and sulfur hexafluoride (SF₆).

Chemical Formulas:

- A chemical formula is a symbolic representation of a chemical compound, indicating the type and number of each atom present in a molecule.

1. **Empirical Formula:**

- Represents the simplest, most reduced ratio of elements in a compound.
- For example, the empirical formula for hydrogen peroxide is HO.

2. **Molecular Formula:**

- Represents the actual number of atoms of each element in a molecule.
- Using hydrogen peroxide again, its molecular formula is H₂O₂.

Bonding in Molecules:

1. **Covalent Bonds:**

- Covalent bonds involve the sharing of electrons between atoms.
- These bonds are common in molecular compounds.

2. **Ionic Bonds:**

- In ionic compounds, electrons are transferred from one atom to another, resulting in the formation of ions.
- The electrostatic attraction between oppositely charged ions forms the ionic bond.

Isomers:

- Isomers are molecules that have the same molecular formula but different structural arrangements of atoms.

1. **Structural Isomers:**

- Isomers with different structural arrangements of atoms.
- Example: Butane and isobutene.

2. **Stereoisomers:**

- Isomers with the same connectivity of atoms but different spatial arrangements.
- Includes cis-trans isomers and enantiomers.

Functional Groups:

- Functional groups are specific arrangements of atoms within molecules that determine their chemical properties.

1. **Hydroxyl Group (-OH):**

- Found in alcohols and sugars.

2. **Carbonyl Group (C=O):**

- Present in aldehydes and ketones.

3. **Amino Group (-NH₂):**

- Characteristic of amines.