Position Isomerism

Definition:
Position isomerism occurs when compounds with the same molecular formula have the same carbon skeleton and functional groups but differ in the position of the functional groups or substituents on the carbon chain.
Key Features:

- The molecular formula and carbon skeleton remain the same.
- The position of a functional group, double bond, or substituent varies, leading to different isomers.

Examples:

1. **Butanol ($C_4H_{10}O$):**
    - **1-Butanol:** The hydroxyl group (-OH) is attached to the first carbon atom.
        - Structural formula: $CH_3CH_2CH_2CH_2OH$
    - **2-Butanol:** The hydroxyl group (-OH) is attached to the second carbon atom.
        - Structural formula: $CH_3CH_2CH(OH)CH_3$
2. **Chloropropane (C_3H_7Cl):**
    - **1-Chloropropane:** The chlorine atom (Cl) is attached to the first carbon atom.
        - Structural formula: $CH_3CH_2CH_2Cl$
    - **2-Chloropropane:** The chlorine atom (Cl) is attached to the second carbon atom.
        - Structural formula: $CH_3CHClCH_3$
3. **Butene (C_4H_8):**
    - **1-Butene:** The double bond is between the first and second carbon atoms.
        - Structural formula: $CH_2=CHCH_2CH_3$
    - **2-Butene:** The double bond is between the second and third carbon atoms.
        - Structural formula: $CH_3CH=CHCH_3$

    1-Butene and 2-Butene
4. **Nitrobenzene ($C_6H_5NO_2$):**
    - **Ortho-Nitrotoluene:** The nitro group (NO_2) is attached to the second carbon atom relative to the methyl group.
    - **Meta-Nitrotoluene:** The nitro group (NO_2) is attached to the third carbon atom relative to the methyl group.
    - **Para-Nitrotoluene:** The nitro group (NO_2) is attached to the fourth carbon atom relative to the methyl group.

Characteristics of Position Isomers:

- They exhibit different physical properties such as boiling points, melting points, and solubilities due to the difference in the position of functional groups or double bonds.
- Their chemical reactivity can also differ depending on the position of the functional groups or double bonds within the molecule.