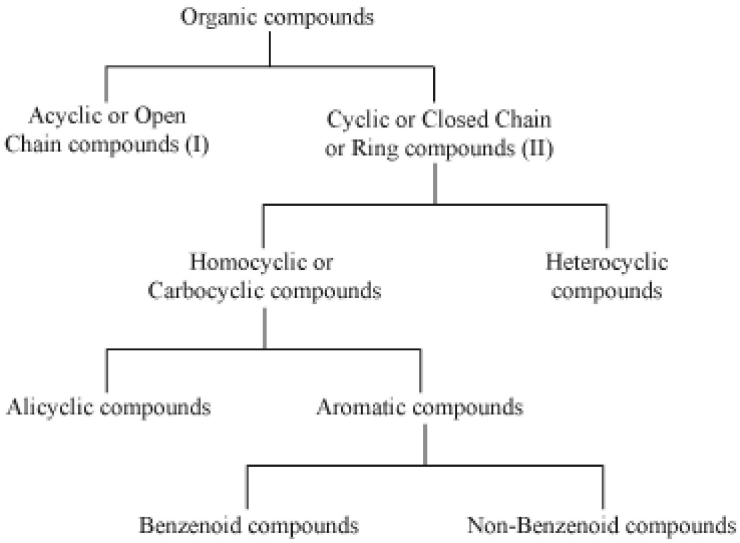
12. Basic principles and techniques in organic chemistry



- Acyclic or open chain compounds consist of straight or branched chain compounds.
- Alicyclic or closed chain or ring compounds contain carbon atoms joined in the form of ring (homocyclic). In some rings (heterocyclic), atoms other than carbon are present.
- Benzenoid aromatic compounds (include benzene and other related compounds)
- Non-benzenoid compounds (do not contain benzene ring)
- Functional group: An atom or group of atoms joined in a specific manner which is responsible for the characteristic chemical properties of the organic compound. For example, alcohol, aldehyde etc.
- Homologous series: A group or a series of organic compounds each containing a characteristic functional group. Successive members differ from each other in molecular formula by a $-CH_2$ unit.

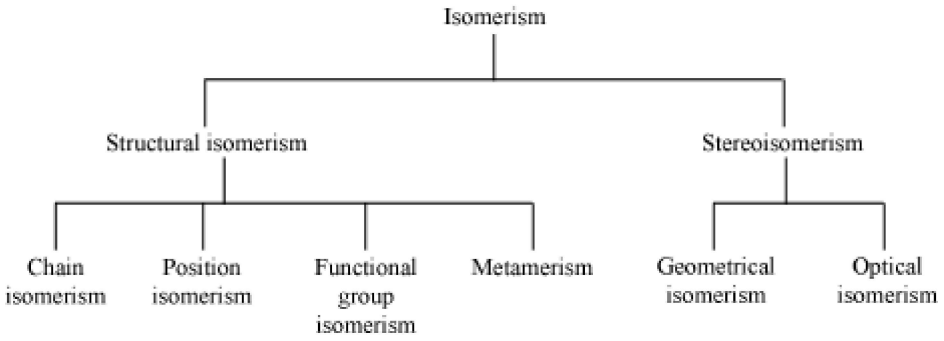
Melting Point

- The normal melting point of a solid is defined as the temperature at which the solid state and liquid state of that solid are in equilibrium at an external pressure of one atmosphere.
- Generally, the capillary tube method is used for the determination of the melting point of a compound but this method is less useful for oil and fat.
- Pure compounds have sharp and well-defined melting point, while impure compounds do not have sharp melting point.
- The concept of melting point is used for the identification and characterisation of organic compounds.

Boiling Point

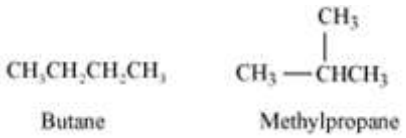
- Boiling point of a liquid is defined as the temperature at which the vapour pressure of the liquid becomes equal to the atmospheric pressure.
- For the determination of boiling point of a liquid, a micro boiling point apparatus based on Thiele's tube is used.
- Boiling point of a liquid decreases as the atmospheric pressure or applied pressure decreases.
- It is the physical property of the any compound by which we can identify its purity.

- **Isomerism:**

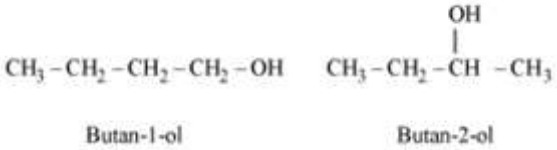


Structural isomerism

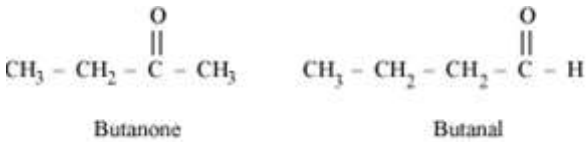
1. Chain isomerism: Two or more compounds having the same molecular formula, but different carbon skeletons



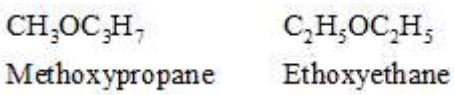
2. Position isomerism: Two or more compounds differing in the position of functional group on the carbon skeleton



3. Functional group isomerism: Two or more compounds having the same molecular formula, but different functional groups



4. Metamerism: Two or more compounds arising due to different alkyl chains on either side of the functional group in a molecule



Stereoisomerism:

Compounds having the same constitution and sequence of covalent bonds, but different relative positions of their atoms or groups in space

Fundamental concepts in organic reaction mechanism:

Fission of a covalent bond

Heterolytic cleavage: Formation of cations and anions takes place.

The increasing order of stability of carbocations is

$$\overset{+}{C}H_3 < CH_3\overset{+}{C}H_2 < (CH_3)_2\overset{+}{C}H < (CH_3)_3\overset{+}{C}$$

Homolytic cleavage: Formation of free radicals takes place.

The increasing order of stability of alkyl radicals is

$$\overset{\square}{C}H_3 < \overset{\square}{C}H_2CH_3 < \overset{\square}{C}H(CH_3)_2 < \overset{\square}{C}(CH_3)_3$$

Nucleophiles and electrophiles

Nucleophile (Nu:) : Nucleus seeking. For example: hydroxide (HO^-), cyanide (CN^-),

Electrophile (E^+) : Electron seeking. For example: carbonyl group (>C=O) or alkyl halides