

KARACHI EDU • CHEMISTRY CLASS X • CHAPTER 3

Organic Chemistry

Comprehensive coaching notes covering hydrocarbons, sources of organic compounds, homologous series, functional groups, and petroleum chemistry.



Introduction & Vital Force Theory

The evolution of organic chemistry from vitalism to modern synthesis.



Vital Force Theory (Berzelius)

Belief that organic compounds could only be synthesized by living organisms through a 'vital force'.

Disproved in 1828 by Friedrich Wöhler via urea synthesis from ammonium cyanate.



Modern Definition

Chemistry of hydrocarbons and their derivatives.

Centered on carbon due to its unique catenation and tetravalency properties.

Unique Characteristics of Carbon

Why carbon forms millions of organic compounds.

Catenation

Ability of carbon atoms to link with other carbon atoms through covalent bonds to form long chains and rings.

Tetravalency

Carbon has 4 valence electrons, allowing it to form four strong covalent bonds with diverse elements (H, O, N, halogens).

Multiple Bonding

Capacity to form stable single, double, and triple bonds with carbon and other atoms (O, N).

Major Sources of Organic Compounds

Natural reservoirs and industrial origins.

- 1 Petroleum (Crude Oil):** Complex mixture of hydrocarbons separated into fractions via fractional distillation.
- 2 Coal:** Destructive distillation yields coal tar, coke, and coal gas (source of aromatic compounds).
- 3 Natural Gas:** Composed mainly of methane (CH_4); vital fuel and chemical feedstock.

Classification of Organic Compounds

Open Chain (Aliphatic)

Compounds with open chains of carbon atoms (straight or branched).

Example: Propane ($\text{CH}_3\text{-CH}_2\text{-CH}_3$)

Closed Chain (Cyclic)

Compounds containing rings of carbon atoms (Alicyclic or Aromatic like benzene).

Example: Benzene (C_6H_6)

Homologous Series & Characteristics

A family of organic compounds with similar chemical properties.

Successive members differ by a $-\text{CH}_2-$ group (molecular mass increase of 14 amu).

1. Same general formula

2. Similar chemical properties

3. Gradual change in physical properties

Prepared using common general methods in the laboratory.

Functional Groups in Organic Chemistry

Specific atoms or groups responsible for characteristic chemical reactions.

Alcohols (-OH)

Hydroxyl group attached to alkyl radical (e.g., $\text{C}_2\text{H}_5\text{OH}$).

Aldehydes (-CHO)

Formyl carbonyl group at chain terminal (e.g., HCHO).

Carboxylic Acids (-COOH)

Carboxyl group exhibiting acidic properties (e.g., CH_3COOH).

Hydrocarbon Families

Compounds composed solely of carbon and hydrogen.

Alkanes (Paraffins)

Saturated hydrocarbons with single bonds. Formula: C_nH_{2n+2} .

Alkenes (Olefins)

Unsaturated with at least one double bond. Formula: C_nH_{2n} .

Alkynes (Acetylenes)

Unsaturated with at least one triple bond. Formula: C_nH_{2n-2} .

Petroleum Refining & Fractions

Separating crude oil based on boiling point ranges.

Gasoline (Petrol)

Boiling range 40°C - 200°C; used as motor vehicle fuel.

Kerosene

Boiling range 175°C - 325°C; used for jet fuel and heating.

Diesel Oil

Boiling range 250°C - 350°C; used for heavy diesel engines.

KARACHI EDU • COACHING NOTES

Chapter 3 Complete

Review hydrocarbon nomenclature, functional group identification, and petroleum fractions for your Karachi Board examinations.

