Organic Chemistry: Comprehensive Notes & Workbook

1 Introduction to Organic Chemistry

Organic chemistry is the study of **carbon-based compounds**, essential to life and technology. Organic molecules are characterized by the presence of carbon atoms, often bonded with hydrogen, oxygen, nitrogen, and other elements.

Key Concepts

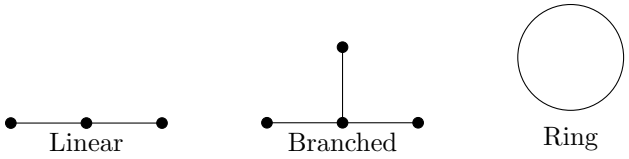
- **Valency**: Carbon has four valence electrons, meaning it forms up to four covalent bonds.
- **Bonding**: Allows for single, double, and triple bonds.
- **Structures**: Chains (linear and branched), rings, and complex frameworks.
- **Organic Compounds in Everyday Life**:
  - *Hydrocarbons*: Fuels (e.g., methane, gasoline)
  - *Biomolecules*: Proteins, carbohydrates, DNA
  - *Materials*: Plastics, fibers, rubber
  - *Medicines, dyes, food additives*

Diagrams and Visuals

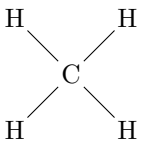
(a) Carbon Atom Electron Dot Structure

Carbon atom: 

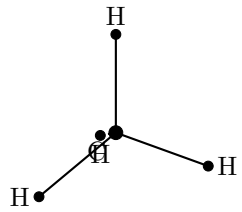
(b) Types of Carbon Skeletons



(c) Tetrahedral Structure of Methane (CH_4)



3D Structure:



Cognitive Challenge

1. **Why does carbon form so many compounds compared to other elements?**
   (Consider electron configuration and the concept of catenation.)

2. **Draw and compare the electron dot structures of methane (CH_4), ammonia (NH_3), and water (H_2O).**
   What do you observe about the central atom and bonding? **Imagine you are a carbon atom in a vast universe of elements**

Advanced Thought (Cognitive Extension)

3. Why is the bond angle in methane (CH_4) *about* 109.5°? Draw this in 3D.

- Carbon forms both long chains and rings. How does this contribute to the diversity of organic chemistry?
- Predict what would happen if carbon could only form three bonds instead of four. How would organic chemistry change?