Quick Study ACADEMIC

ORGANIC CHEMISTRY FUNDAMENTALS

Types of Organic Compounds

Organic chemistry is the study of natural and synthetic materials that have carbon atoms as the key chemical feature. There are more than one million known organic compounds.

HYDROCARBON

ALKANE

- **Ethane:** C_2H_6
- **Methyl (Me):** $-CH_3$
- **Ethyl (Et):** $-C_2H_5$

C—H
C—C

ALKENE

- **Ethene:** C_2H_4
- **Diene:** Two C=C
- **Triene:** Three C=C

ALKYNE

—C≡C—

- **Ethyne:** C_2H_2

AROMATIC

- **Benzene:** C_6H_6
- **Arene:** C_6H_5 (Ar-)

-O- ADDED

ALCOHOL

R—OH

- **Methanol:** Me-OH (methyl alcohol)
- **Phenol:** Ar-OH
- **Diol/Glycol:** (2 -OH)
- **Glycerol:** (3 -OH)

ETHER

R—O—R

- **Ethoxyethane:** Et-O-Et (diethyl ether)

EPOXY

- **Oxirane:** C_2H_4O (ethylene oxide)

PEROXIDE

R-O-O-R'

- **Acetone Peroxide:** $C_9H_{18}O_6$
- **Benzoyl Peroxide:** $C_{14}H_{10}O_4$

>C =O ADDED

ALDEHYDE

- **Methanal:** H_2CO (formaldehyde)
- **Benzaldehyde:** Ar-CHO

KETONE

- **2-propanone:** Me-CO-Me (dimethyl ketone, acetone)
- **Diketone:** R-CO-R"-CO-R'

>COO ADDED

CARBOXYLIC ACID

- **Ethanoic Acid:** Me-COOH (acetic acid)
- **Acetate Ion:** Me-COO⁻
- **Benzoic Acid:** Ar-COOH

Dicarboxylic Acid

HOOC-R-COOH

ESTER

- **Ethyl Acetate:** Me-CO-OEt

Other derivatives:

- **Peroxyacid:** R-CO-OOH
- **Acid Anhydride:** RCO-O-CO-R'

NITROGEN ADDED

R—N—R
    |
    R

AMINE

- **Methyl Amine:** H_3C-NH_2
- **Phenylamine:** Ar-NH_2 (aniline)
- R-NH_2 (1°), RR'NH (2°), RR'R"N (3°)

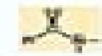
NITRO R—NO_2

DIAZO R—N≡N

NITRILE R—C≡N

- **Methane Nitrile:** Me-CN

AMIDE



- **Acetamide:** Me-CO-NH_2

SULFUR ADDED

- **Thiol:** R-SH
- **Thioether:** R-S-R'
- **Disulfide:** R-S-S-R'
- **Thiol Ester:** R-CO-SR'
- **Sulfoxide:** R-SO-R'
- **Sulfone:** R-SO_2-R'
- **Sulfonic Acid:** R-SO_3H

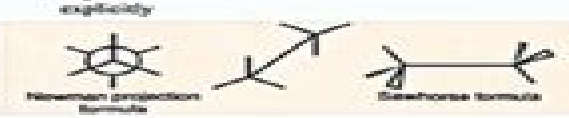
HALOGEN ADDED

R—X:

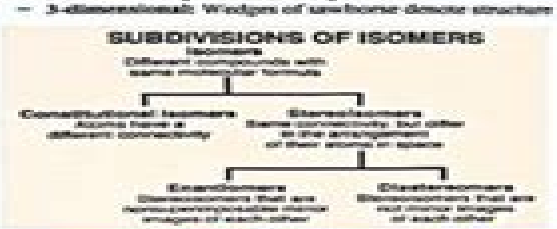
- **Haloalkane:** Me-Cl chloromethane
- **Halobenzene:** Ar-X
- **Chlorobenzene:** Ar-Cl
- **Acyl Halide:** R-CO-X
- **Aryl Halide:** Ar-X

Formulas & Isomers

- **Molecular Formula:** Elemental symbols with subscripts denote the composition of a compound
  - **Empirical Formula:** Subscripts denote the relative elemental composition
  - Graphical depiction
    - **Dash Formula:** Diagram all atoms; show bonds as dashes
  - **Bond-Line Formula:** Hide H; carbon atoms are depicted as lines, but other atoms are shown explicitly



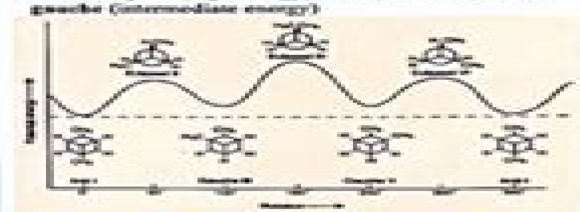
- **Newman Projection:** 2-d depiction
- **3-dimensional:** Wedges of sawhorse denote structure



- **Constitutional Isomers:** Different bonding connectivity (e.g., rings, bonds, branching, substituent positions)
- **Tautomers:** Easily interconverted structural isomers (e.g., keto-enol for ketone)
- **Chiral:** Not identical with its mirror image
- **Achiral:** Has a plane of symmetry (i.e., superimposable on its mirror image)
- **Epimers:** Pair of diastereomers which differ only in the configuration of one atom
- More than 1 chiral center
  - n chiral centers, ≤ 2^n stereoisomers
  - **Meso:** 2 chiral centers, 4 isomers: 3 stereoisomers, 1 achiral (mirror-plane)

- **R/S Notation:** The 4 different atoms or groups attached to a central atom are ranked (a), (b), (c), and (d), by molar mass. The lowest (d) is directed away from the viewer and the sequence of a-b-c produces clockwise (R) or counter-clockwise (S) configuration
  - **Chiral (Optically Active):** + or – the rotation of plane polarized light. R/S: opposite effects
  - **Racemic:** 50/50 mixture of stereoisomers (no net optical activity)
  - **Nomenclature:** Note R/S and +/- in the compound name (e.g., R (+) bromochlorofluoromethanol)
- **Fisher-Projection:** Diagram depicts chiral/3-D structure
  - **Molecular Conformations:** Molecule exhibits structural variation due to free rotation about C-C single bond:

- **Newman-Diagram:** Depict rotation about a C-C bond; **eclipsed** (high energy), **anti** (low energy), and **gauche** (intermediate energy)



Common Terms

Aliphatic: Non-aromatic
Aromatic: Benzene ring
Conjugation: Sequence of alternating double (or triple) and single bonds
Dielectric Effect: [illegible] ion fo[illegible]
Exergonic Reaction: Chemical reaction that loses energy during the process of the reaction
Heterocyclic: Non-carbon atom in the ring structure
H[illegible]
Ketose: Molecule made up of a monosaccharide bonded to a ketone
Monosaccharide: Carbohydrate that cannot be reduced by hydrolysis into another simple sugar
Olefin: Alkene
Paraffin: Alkane
Radioisotope: Isotope that is radioactive
Saturated: Maximum # of Hs (all C-C single bonds)
Tetrose: Monosaccharide with four carbon atoms
Unsaturated: At least one C-C multiple bond
Zymurgy: The study of the process of fermentation

Fundamentals Of Organic Chemistry

Victor M. Corman

Fundamentals Of Organic Chemistry:

The book delves into Fundamentals Of Organic Chemistry. Fundamentals Of Organic Chemistry is a crucial topic that must be grasped by everyone, ranging from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Fundamentals Of Organic Chemistry, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
    - Chapter 1: Introduction to Fundamentals Of Organic Chemistry
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4. In chapter 3, the author will examine the practical applications of Fundamentals Of Organic Chemistry in daily life. This chapter will showcase real-world examples of how Fundamentals Of Organic Chemistry can be effectively utilized in everyday scenarios.
5. In chapter 4, the author will scrutinize the relevance of Fundamentals Of Organic Chemistry in specific contexts. This chapter will explore how Fundamentals Of Organic Chemistry is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, the author will draw a conclusion about Fundamentals Of Organic Chemistry. The final chapter will summarize the key points that have been discussed throughout the book.
   This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Fundamentals Of Organic Chemistry.

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