

KEY CONCEPTS IN ORGANIC CHEMISTRY



Jagiellonian University

Medical College

School of Medicine in English

ORGANIC CHEMISTRY

1. Structure and bonding in organic chemistry

- 1.1. Hybridization and molecular shapes;
- 1.2. Carbon atom and its properties in organic compounds;
- 1.3. Carbon skeletons with single and multiple bonds;
- 1.4. Functional groups;
- 1.5. Structural and skeleton formulas of organic compounds;
- 1.6. Lewis structures, formal charges;

2. Classification and properties of organic compounds

- 2.1. Hydrocarbons
 - 2.1.1. Alkanes, alkenes, alkynes, aromatic compounds
 - 2.1.2. Homologous series
 - 2.1.3 Alkyl halides, Nitro compounds;
- 2.2. Alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and their derivatives;
- 2.3. Amines, amino acids, peptides and proteins;
- 2.4. Lipids, carbohydrates, heterocyclic bases, nucleotides, nucleic acids;
- 2.5. Isomerism: Structural isomers, tautomers, resonance forms

3. Nomenclature of organic compounds

- 3.1. Hydrocarbons of various classes;
- 3.2. Compounds with one functional group;
- 3.3. Compounds with more functional groups;

4. Stereochemistry

- 4.1. Stereoisomers;
- 4.2. Z/E stereoisomers;
- 4.3 Cis -trans isomers
- 4.4. Enantiomers and diastereomers;
- 4.5. Conformations;

5. Organic reactions

- 5.1. Types of organic reactions: addition, substitution, elimination;
- 5.2. Mechanisms of organic reactions;
 - 5.2.1. Nucleophilic substitution, nucleophiles;
 - 5.2.2. Elimination;
 - 5.2.3. Electrophilic substitution in aromatic compounds, electrophiles;
 - 5.2.4. Radical substitution, radical processes, radicals
- 5.4. Reduction and oxidation in organic chemistry;
- 5.6. Rearrangements in organic compounds;
- 5.7. Some characteristic reactions of functional groups: amide bond formation, acetal

creation, ester formation and hydrolysis.

6. Organic polymers;

Keywords: Isomers, sp^3 , sp^2 and sp hybridization, homologous series, tetravalent carbon, single, double and triple bonds, conjugated systems of multiple bonds, resonance, aromaticity, hydrocarbons, alkanes, alkenes, alkynes, substituents, heteroatoms, alkyl halides, alkyl group, primary, secondary and tertiary alcohols and amines, aldehydes and ketones, carbonyl group, carboxyl group, acids, esters, amides, anhydrides, nitro compounds, conformers, Z/E stereoisomers, enantiomers, diastereomers, Fischer projections, nucleophiles, electrophiles, reaction mechanisms, carbocation, radical, addition, substitution, elimination, reduction, oxidation, rearrangement, biomolecules, fatty acids, lipids, soaps, waxes, micelles, mono-, oligo and polysaccharides, triose, tetrose, pentose, hexose, aldose, ketose, hemiacetals, acetals, pyranose, furanose, amino acids, polymers.

RECOMMENDED TEXTBOOKS

(The three following positions for choice, the fourth one for more ambitious pupils.)

1. Hrvoj Vančik, *Basic Organic Chemistry for the Life Sciences* (179 pages), Springer International Publishing Switzerland 2014
ISBN: 978-3-319-07604-1
2. Graham Patrick, *BIOS Instant Notes in Organic Chemistry* (328 pages), Garland Science, Taylor & Francis Group 2012
ISBN 978-1-8599-6264-0
3. Andy Parsons, *Keynotes in Organic Chemistry* (300 pages), Wiley (second edition) 2014
ISBN: 978-1-119-99914-0
4. David J. Hart, Christopher M. Hadad, Leslie E. Craine, Harold Hart, *Organic Chemistry A Short Course* (608 pages), BROOKS/COLE CENGAGE Learning (13th Edition)
ISBN: 13:978-1-111-42556-2