

Karta przedmiotu / Course description

Informacje ogólne o przedmiocie / General information about the course	
1. Kierunek studiów / Major of study: Medical Biotechnology	2. Poziom kształcenia / Study level: I 3. Forma studiów / Form of study: full-time studies
4. Rok / Year: I	5. Semestr / Semester: II
6. Nazwa przedmiotu / Course name: Organic Chemistry	
7. Status przedmiotu / Course status: obligatory	
8. Jednostka realizująca przedmiot, adres, e-mail: Name of Department, mailing address, e-mail: Department of Organic Chemistry, Faculty of Pharmaceutical Sciences, 41-200 Sosnowiec, Poland	
9. Treści programowe przedmiotu Course contents:	
<p>The major aim of this course is to provide students with knowledge about the nomenclature, structure, reactions, and properties of organic compounds to such an extent that they can further study the synthesis, transformation and action of organic compounds. The organic chemistry curriculum addresses the teaching needs of biochemistry, drug biotechnology, and biochemical technology.</p> <p>After completing the course in organic chemistry, the student is able to handle chemical reagents, receive and purify organic compounds on a laboratory scale, name them, describe their structure, and properties, interpret the results of spectroscopic analysis.</p>	
10. liczba godzin z przedmiotu / Number of hours for the course	45
11. liczba punktów ECTS dla przedmiotu / Number of ECTS points for the course	5
12. Formy i tematy zajęć / Forms and topics of classes 12.1. Lectures	Liczba godzin Number of hours
<p>W1. Introduction. The subject of organic chemistry. Chemical bonds. Atomic and molecular orbitals. Hybridization. Relationship patterns. Resonance (mesomerism). Electronic effects. Aliphatic hydrocarbons. Nomenclature. The isomerism of alkanes. Conformations of alkanes. Radical chlorination of alkanes. Spatial structure of cycloalkanes. Electronic structure of double and triple bonds. Cis-trans and E-Z isomerism of alkenes. Electrophilic addition reactions of alkenes. Markovnikov rule. Polymerization reactions. Acid properties of α-alkynes. Alkyn addition reactions. Oxidation and reduction reactions of aliphatic hydrocarbons.</p>	2
<p>W2. Aromatic hydrocarbons. Arenas nomenclature. Structure of benzene. The concept of aromaticity. Electrophilic aromatic substitution reactions include halogenation, nitration, sulfonation, alkylation, and acylation. Direct influence of substituents. Radical chlorination reaction. Structure and reactions of biphenyl and naphthalene.</p>	2
<p>W3. Halogenated hydrocarbons. Nomenclature. Nucleophilic substitution reactions according to the mechanisms of SN1 and SN2. Nucleophilicity and basicity of a nucleophilic factor. Nucleophilic substitution reactions according to the SNAr2 mechanism. Elimination reactions according to the mechanisms E1 and E2. Zaitsev and Hofmann rules. Directions of transformations of monohalogen derivatives. Alcohols and phenols. Nomenclature. Hydrogen bond. Acidic and basic properties of alcohols. Substitution, dehydration, oxidation, etherification, and esterification reactions.</p>	2

Polyhydric alcohols - glycerol reactions. Fats and lipids. Acid properties of phenols. Reactions of etherification and esterification of phenates. Electrophilic aromatic substitution reactions.

W4. Aldehydes and ketones. Nomenclature. Electronic structure of the carbonyl group. Keto-enol tautomerism. Addition reactions. Aldol condensation reactions. Cannizzaro reaction. Haloform reaction. Reduction and oxidation reactions. Differentiation between aldehydes and ketones.

2

W5. Carboxylic acids and derivatives. Nomenclature. Hydrogen bonds. Mono and dicarboxylic acids. Acid strength - influence of substituents. Decarboxylation and dehydration reactions. Salt formation. Chlorides and acid anhydrides. The acylation reaction. Esterification reaction and ester reactions. Claisen condensation reaction. Soaps. Amides.

2

W6. Optically active compounds. Chirality. Compounds with an asymmetric carbon atom. Enantiomers and the racemic mixture. Determining the configuration according to the D / L and R / S system. D (+) - glyceraldehyde. Diastereoisomers. Optically active compounds without an asymmetric carbon atom. Resolution of racemic mixtures.

Carbohydrates. Classification and nomenclature. Monosaccharides, the formation of deposits and esters. D / L configuration, Fischer formulas. D (+) glucose, D (-) fructose. Epimerization. Sugar ring structures, Haworth formulas, anomers. Mutarotation. Glycosides. Reducing and nonreducing sugars. Oligosaccharides: maltose, lactose and sucrose. Polysaccharides - cellulose and starch.

2

W7. Amines. Nomenclature. Alkalinity of amines. Formation of ammonium salts. Differentiation of the order of amines. Acylation and oxidation reactions. Benzenediazonium salts - exchange and coupling reactions.

Amino acids. Patterns and names of selected natural amino acids. Ion androgynous. Synthesis of α -amino acids. Amino acid reactions. Peptides. Determination of the amino acid sequence. Proteins.

2

W8. Heterocyclic compounds - selected issues. Nomenclature of compounds with 5 and 6 members. Pyrrole, thiophene, furan, and Indole. Acid properties of pyrrole. Electrophilic substitution reactions. Pyridine and its derivatives. Basic properties. Electrophilic and nucleophilic substitution reactions. Quinoline. Pyrimidine derivatives. Purines. Nucleic acids.

1

12.2 Laboratory classes

C1. Introductory news. Organization and regulations of the laboratory, health and safety regulations. First aid. Basic laboratory equipment. Learning laboratory techniques.

C2. Determination of the physicochemical properties of organic compounds - determination of melting point and boiling point.

C3. Synthesis of a liquid organic compound. Test of knowledge of the distillation technique.

2

C4. Synthesis of an organic compound as a solid. Test of knowledge on the technique of filtration and crystallization.

4

C5. Application of TLC and spectroscopic methods (^1H NMR, IR, MS) in the identification of products. Test.	10 10 4
13. Literatura / Readings "Organic Chemistry" John McMurry "Essentials of Organic Chemistry" Paul M Dewick "Organic Chemistry" Janice Gorzynski Smith "Experimental Organic Chemistry" Daniel R. Palleros	
14. Kryteria oceny – szczegóły / Detail evaluation criteria Zgodnie z zaleceniami organów kontrolujących / <i>In accordance with the recommendations of the inspection bodies</i> Zaliczenie przedmiotu - student osiągnął zakładane efekty uczenia się / <i>Completion of the course – student has achieved the assumed learning outcomes</i> Szczegółowe kryteria zaliczenia i oceny z przedmiotu są zamieszczone w regulaminie przedmiotu / <i>Detail criteria for completion and evaluation of the course are specified in the course regulations</i>	