

Course title: Biochemistry with Elements of Organic Chemistry

ECTS credit allocation (and other scores): 6

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 75

Course coordinator/ Department and e-mail: Edyta Sienkiewicz-Szłapka / Biochemistry,  
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Type of classes: classes and lectures

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#### Substantive content

**CLASSES:** Organic chemistry computational tasks. Basic laboratory techniques (crystallization, distillation, sublimation, extraction, chromatography). Organic preparation. Spectrophotometric, chromatographic and electrophoretic methods in the qualitative and quantitative analysis of amino acids, proteins, nucleic acids, lipids, carbohydrates and their metabolism products. Isolation of enzymes and determination of their activity. Identification of selected non-protein products of nitrogen metabolism in animals and plants.

**LECTURES:** Structure and properties of organic compounds: hydrocarbons, alcohols and thiols, ethers, aldehydes and ketones, carboxylic acids and esters, carbohydrates, lipids, amines, amides and heterocyclic compounds, amino acids, peptides and proteins, nucleic acids. Enzymes - basic concepts and kinetics. The main aspects of the storage and expression of genetic information. Carbohydrate metabolism - glycolysis, gluconeogenesis, pentose phosphate cycle, glycogen synthesis and degradation. Lipid metabolism - transformations of triacylglycerols and complex lipids, oxidation and synthesis of fatty acids, ketogenesis, cholesterol metabolism. Bioenergetics: the nonspecific phase of biological oxidation - the citric acid cycle, electron transport and oxidative phosphorylation, the mechanism of light energy use (photosynthesis). Nitrogen metabolism - nitrogen cycle, amino acid metabolism, urea cycle, structure and metabolism of porphyrins, outline of nucleotide metabolism.

**LEARNING PURPOSE:** Learning about the basic classes of organic compounds allowing to understand the relationship between the structure of the molecule and its physical, chemical and biological properties, as well as the basic biochemical processes necessary to understand the phenomena studied later on during the studies; familiarization with laboratory techniques used in the analysis of organic chemistry and biochemistry as well as methods of quantitative data analysis and making inferences based on the results of experiments; developing the ability to search for reliable information in the field of chemistry and biochemistry; emphasis will be placed on shaping a pro-ecological attitude by using the postulates of green chemistry in organic synthesis and on realizing the need to the constant expanding of knowledge in the field of the biochemical basis of processes taking place in the body

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On completion of the study programme the graduate will gain:

**Knowledge:** structure and properties of molecules of individual classes of organic compounds, structure, properties and functions of major organic polymers (proteins, carbohydrates, lipids and nucleic acids), cell catalytic strategies and mechanisms of action of particular types of enzymatic cofactors, the main principles of the storage and expression of genetic information, the course of the basic metabolic pathways and indicates their interrelationships (gives names and describes the structures of intermediate metabolites; specifies enzymes that catalyze subsequent stages, discusses the mechanisms of their regulation, determines their location at the cellular and organ level), principles of basic methods and techniques used in qualitative and quantitative analysis used in the laboratory of organic chemistry and biochemistry (crystallization, distillation, sublimation, extraction, spectrophotometry, chromatography and electrophoresis), taking into account the postulates of green chemistry

Skills: performing simple organic syntheses; isolating compounds from biological material; conducting experiments aimed at the identification, qualitative and quantitative evaluation of basic organic compounds; analyzing the obtained results and drawing conclusions based on them; preparation of documentation on the performed experiments; individual and teamwork; the use of (bio) chemical language in specialized discussions

Social Competencies: shaping awareness of the need to constantly update one's knowledge and improve professional competencies, developing the habit of complying with the rules of occupational health and safety in the laboratory, responsibility for the safety of oneself and the safety of the environment

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Literature: 1) Patrick G., Instant Notes from Organic Chemistry, Wyd. Taylor Francis, R. 2004, s. 368; 2) Timbelake K. C., Chemistry. An introduction to general, organic, and biological chemistry, Wyd. Pearson Education Inc., R. 2018, s. 720; 3) Hames D., Hooper N., Instant Notes from Biochemistry, Wyd. Taylor Francis, R. 2011, s. 478; 4) Berg J.M, Tymoczko J.L., Stryer L., Gatto G.J., Biochemistry, Wyd. Freeman and Company, R. 2012, s. 1117; 5) Harvey R., Ferrier D., Lippincot's Illustrated Reviews - Biochemistry, Wyd. Wolters Kluwer, R. 2017, s. 567

The allocated number of ECTS points consists of: 6

Contact hours with an academic teacher: 12.00-14.00 Monday