



48SJ-BECHI

ECTS: 6

YEAR: 2020L

BIOCHEMISTRY WITH ELEMENTS OF CHEMISTRY 1/2**BIOCHEMISTRY WITH ELEMENTS OF CHEMISTRY 1/2****COURSE CONTENT
CLASSES**

SEMINARS. Obligatory problems: Water and pH. The major buffer system in the body. Metabolic acidosis and alkalosis. Oxygen toxicity and free-radical injury. Biochemistry of cell membranes. Blood plasma proteins. Hemostasis and thrombosis. Disorders of synthesis and/or structure of proteins. Processing of proteins in the cells. Additional problems: Diagnostic enzymes. The Human Genome Project and gene therapies. Telomeres and telomerase. The molecular biology of cancer. Interactions between food and drugs. LAB CLASSES. Determination of the dissociation constant of the weak acid. Determination of the rate constant of a chemical reaction. Buffers and determination of the buffer capacity. Spectrum analysis of hemoglobin derivatives. Preparation of aspirin. Stoichiometric calculations. Calculation of the solutions concentrations and doses of drugs. Quantitative protein identification. Electrophoresis of serum proteins. Fibrinogen release and its quantitative identification. Isolation and identification of potato peroxidase activity. Identifying the Michaelis constant of potato peroxidase. Identifying the activity of ALT, AST, and γ -GT in blood serum.

LECTURES

Atoms and elements; Structure of the atom; Chemical compounds and their bonds: octet rule, ionic compounds; covalent compounds. The bases of chemical calculations: atomic mass, molecular weight, and the mol. Stoichiometry of chemical reaction. Properties of solution. The solubility of the substance. Water as a solvent. The ways of the expressing of solutions concentrations. Oxydation-reduction reactions. Colloids. Osmotic pressure. Isotonic, hypotonic and hypertonic solutions. Dialysis. Reactions in aqueous solutions: electrolytic dissociation; the proton theory of acids and bases; ionization of water; the pH scale; chemical indicators; ionic reactions: precipitation and the product of solubility, the reactions of weak electrolytes receiving, hydrolysis. Buffers. Structures and properties of the major compounds of the body: organic compounds and its functional groups; structure and properties of carbohydrates (monosaccharides, glycosides, oligo- and polysaccharides) and lipids (fatty acids, acylglycerols, phosphoacylglycerols, sphingolipids, steroids and eicosanoids). Chemical modification of lipids. Nitrogen-containing compounds (amino acids and heterocyclic compounds). Peptides and proteins structure, properties and functions. Enzymes – properties, kinetics of reaction and activity regulation. DNA structure, replication and repair. RNA structure, synthesis and processing. Protein synthesis. Regulation of gene expression.

EDUCATIONAL OBJECTIVE:

During the course, the students are familiarised with molecular basics of human body functioning in correct and pathological conditions. They master the main metabolic pathways and are familiarized with genetic and environmental factors disturbing their course. The students also learn basic laboratory methods and techniques as well as the equipment applied in laboratory diagnostics. As a result, they obtain expertise and skills necessary to understand the subjects taught in their further education (i.e.: physiology, immunology, pathology, clinical subjects) and indispensable in their future professional practice.

DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN RELATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study: M/NM+++,

Codes of learning outcomes in a major area of study: B.U10.+ , B.U11.+ , B.U3.+ , B.U4.+ , B.U5.+ , B.U6.+ , B.U8.++ , B.U9.+ , B.W1.+ , B.W10.++ , B.W11.+ , B.W12.++ , B.W13.+ , B.W14.+ , B.W17.+ , B.W2.+ , B.W25.+ , B.W3.+ , B.W4.++ , K.11.+ , K.5+ , K.6.+ , K.9.+ ,

LEARNING OUTCOMES:**Knowledge**

- W1 - knows the structure of matter at the atomic and molecular level
- W2 - knows the properties of the mixtures and solutions as well as processes and reactions taking place in them
- W3 - knows the basics of computational chemistry
- W4 - knows the rules of acid-base equilibrium of solutions and body fluids
- W5 - knows the structure, properties, and functions of basic ingredients of a cell (proteins, carbohydrates, lipids, and nucleic acids)
- W6 - knows catalytic strategies of a cell and differences in actions of various types of enzymatic co-factors as well as applications of enzymes and regulators of their activity in medicine
- W7 - knows the principles of storage and expression of genetic information
- W8 - understands the basics of human body functioning on a molecular level in physiological and pathological conditions

Skills

- U1 - explains the properties of matter on the basis of the atoms and molecules constitution
- U2 - applies the principles of chemical calculations in theory and practice
- U3 - explains the acid-base balance in the body in physiological and pathological terms
- U4 - recognizes and explains the dependency between the structure and the function of an organic compound
- U5 - identifies the ways of intercellular communication and explains working mechanisms of various hormone groups on a molecular level
- U6 - applies the techniques used in laboratory diagnostics
- U7 - analyses and interprets the results of biochemical examinations as well as prepares a final protocol for the

Course/module:

Biochemistry with Elements of Chemistry 1/2

Fields of education:**Course status:** mandatory**Course group:** A - przedmioty podstawowe**ECTS code:****Field of study:** Medicine**Specialty area:** Medicine**Educational profile:** General academic**Form of study:** full-time**Level of study:** uniform master's studies**Year/semester:** 1 / 2**Type of course:**

Classes, Seminar, Lecture

Number of hours per semester/week: Classes: 45, Seminar: 15, Lecture: 20**Teaching forms and methods**

Classes(K1, K2, K3, K4, U1, U2, U3, U6, U7, U8, W2, W3, W4, W5, W6) : conducting experiments, interpretation of the obtained results, Seminar(K1, K2, K4, U2, U3, U4, U5, U8, W2, W3, W4, W5, W7, W8) : Presenting a speech on an assigned subject, multimedia presentation, discussion, case study, debate., Lecture(K1, K4, U1, U3, U4, W1, W2, W3, W4, W5, W6, W7, W8) : lecture with a multimedia presentation and conversations

Form and terms of the verification results:

CLASSES: Report - performing analyses and preparing laboratory report based on the obtained results(K2, U2, U3, U4, U6, U7, W2, W3, W4, W5) ; CLASSES: Written test - short tests (question types: BOFs, MCQs, short answer questions, computational tasks)(K3, U2, U3, U4, U5, U6, U7, W2, W3, W4, W5, W6, W7, W8) ; SEMINAR: Part in the discussion - being active in discussions(K1, K4, U2, U3, U4, U5, U8, W4, W5, W6, W7, W8) ; SEMINAR: Written test - short tests (question types: BOFs, MCQs, short answer questions)(K3, U2, U3, U4, U5, U6, U7, W2, W3, W4, W5, W6, W7, W8) ; SEMINAR: Presentation - an oral presentation of selected problem (with multimedia support) (K1, K2, K4, U2, U3, U4, U5, U8, W2, W4, W7, W8) ; LECTURE: Colloquium test - unit tests (question types: BOFs, MCQs, short answer questions, computational tasks)(K1, K4, U2, U3, U4, W1, W2, W3, W4, W5, W6, W7, W8) ; LECTURE: Written exam - final test comprising the whole programme of the course (about 150 questions); (question types: BOFs, MCQs, short answer questions, computational tasks)(U1, U2, U3, U4, U5, U6, W1, W2, W3, W4, W5, W6, W7, W8)

Number of ECTS points: 6**Language of instruction:** English**Introductory courses:**

Biophysics, Molecular Biology and Genetics

Preliminary requirements:

Standard level of knowledge covered by of the introductory subjects and chemistry (the High School level at least)

Name of the organizational unit offering the course:

conducted experiments

U8 - uses the most recent scientific literature and prepares a multimedia presentation on an assigned topic in an understandable way

Social competence

K1 - is aware of the need update one's knowledge constantly and to improve professional skills

K2 - cooperates and works in a group assuming various roles in it

K3 - completes tasks in a safe way; obeys the rules of the occupational safety and health

K4 - presents favourable attitude towards promotion of pro-healthy lifestyle

BASIC LITERATURE

1) Timberlake Karen C., Chemistry - an introduction to general, organic and biological chemistry, wyd. Prentice Hall, 2018, t. 1, s. 750; 2) Harvey Richard and Ferrier Denise, Lippincott's Illustrated Reviews: Biochemistry, wyd. Wolters Kluwer | Lippincott Williams & Wilkins, 2017, t. 1, s. 551; 3) Lieberman Michael, Marks Allan D., Marks' Basic Medical Biochemistry: A Clinical Approach, wyd. Wolters Kluwer | Lippincott Williams & Wilkins, 2018, t. 1, s. 1000

SUPPLEMENTARY LITERATURE

1) Murray Robert K., Bender David A., Botham Kathleen M., Kennelly Peter J., Rodwell Victor W., Weil P., Harper's Illustrated Biochemistry, wyd. The McGraw-Hill Companies, 2018, t. 1, s. 800; 2) Salway J.G., Medical Biochemistry at a glance, wyd. Wiley-Blackwell, 2012, t. 1, s. 169

Katedra Biochemii,

Person in charge of the course:

dr Edyta Sienkiewicz-Szlapka,

Course coordinators:

dr Edyta Sienkiewicz-Szlapka, , dr Grzegorz Zwierzchowski, , dr Ewa Fiedorowicz, , dr Natalia Kordulewska, , dr Regina Frączek, , dr hab. Anna Cieślińska,

Notes:

Detailed description of the awarded ECTS points - part B

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The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: classes	45 h.
- participation in: seminar	15 h.
- participation in: lecture	20 h.
- consultation	2 h.
	82 h.

2. Student's independent work:

- preparation for the laboratory classes	20 h.
- preparation of an oral speech with multimedia support on seminar classes	8 h.
- preparation to the discussion on seminar classes	20 h.
- preparation to the unit tests (colloquia)	20 h.
	68 h.

1 ECTS point = 25-30 h of the average student's work, number of ECTS points = 150 h : 25 h/ECTS = 6,00 ECTS

on average: **6 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	3,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	2,72 ECTS points,