UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Course sylabus – part A
Biochemistry 1/2

48SJO-BIOCHE12
2024
ECTS: 5.00

SUBJECT MATTER CONTENT:

Amino acids, 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.

Quantitative protein identification. Electrophoresis of serum proteins. Fibrinogen release and its quantitative identification. Isolation and identification of peroxidase activity. Determining the Michaelis constant and maximum velocity for peroxidase reaction. Identifying the activity of ALT, AST, and γ-GT in blood serum. Isolation of genomic DNA from blood cells and cheek epithelium cells. Quantitative and qualitative assessment of isolated DNA. Amplification of selected DNA fragment by PCR method.

The major buffer systems 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.

TEACHING OBJECTIVE:
During the course, students are familiarised with the molecular basis of the functioning of the human body under physiological and pathological conditions. They master the most important metabolic pathways and learn how genetic and environmental factors intervene in their course and what consequences their effects have. Students also learn basic laboratory methods and techniques and the equipment used in laboratory diagnostics. They develop the ability to search for reliable information in the field of medical biochemistry.

DESCRIPTION OF THE LEARNING OUTCOMES OF THE COURSE IN RELATION TO THE DESCRIPTION OF THE CHARACTERISTICS OF THE SECOND LEVEL LEARNING OUTCOMES FOR QUALIFICATIONS AT LEVELS 6-8 OF THE POLISH QUALIFICATION FRAMEWORK IN RELATION TO THE SCIENTIFIC DISCIPLINES AND THE EFFECTS FOR FIELDS OF STUDY:

Symbols for outcomes related to the discipline:
M/NMA_P7S_KO+++++, M/NMA_P7S_ UW+++++++, M/NMA_P7S_UW+++, M/NMA_P7S_WG++++++++++++

Legal acts specifying learning outcomes: 467/2024 (Medicine),
Status of the course:
Group of courses:
Discipline: Medical Sciences

Program: Medicine
Form of studies:full-time
Level of studies: uniform master's studies

Introductory subject: Biophysics, Chemistry, Cytophysiology, Molecular Biology

Prerequisites: Level 4 of The European Qualifications Framework (EQF) at least, and the satisfactory level of knowledge and skills covered by the introductory subjects.

Coordinators:

Edyta Sienkiewicz-Szłapka, edyta.sienkiewicz@uwm.edu.pl

Symbols for outcomes related to the field of study:
K.5+, K.10.+, K.9.+, K.6.+, K.11.+, B.U12.++, B.U11.+, B.U6.+, B.U8.++, D.U7.+, KA7_UW5+, KA7_UU1+, KA7_UK2+, B.W10.++, B.W11.+, B.W12.+++, B.W13.++, B.W2.+, C.W38.+, A.W2.+, B.W16.+, B.W14.+

LEARNING OUTCOMES (Knowledge, Skills, Social competence):

K1 notice one's own limitations and make a self-assessing of educational deficits and needs

K2 express one's opinion sensibly, candidly, and with respectability to the distinct opinion of the interlocutor

K3 cooperate in a multicultural and multinational environment and show an understanding of ideological and cultural differences

K4 present a favorable attitude toward the promotion of a pro-healthy lifestyle

K5 comply with occupational health and safety rules in the laboratory

U1 perform isolation, identification and quantitative assessment of proteins and nucleic acids using basic laboratory and molecular techniques (e.g. spectrophotometry, electrophoresis, PCR)

U2 operate measuring instruments and assess the accuracy of measurements

U3 analyze the results obtained, perform calculations assessing the concentrations or activity of the determined compounds and draw conclusions based on them, prepare documentation of the performed experiments

U4 predict the direction of biochemical processes based on knowledge of regulatory mechanisms

U5 use medical databases and peer-reviewed information sources as well as critically analyze medical literature

U6 prepare and present scientific information in a simple and understandable way (multimedia presentation)

U7 cooperates and works in a group assuming various roles in it

W1 the structure, properties, and functions of basic ingredients of a cell (proteins and nucleic acids)

W2 the course and importance of the processes of synthesis, modification and degradation of proteins and nucleic acids, as well as the health implications of these processes perturbations

W3 functions of the genome, transcriptome and proteome and methods used to study them or used in laboratory diagnostics

W4 concepts of regulation of genetic information expression (from gene to protein)

W5 cell catalytic strategies and mechanisms of action of individual enzymes and their cofactors, as well as their biomedical significance

W6 biochemical aspects of the acid-base balance mechanisms in the body in physiological and pathological conditions

W7 the major sources of reactive oxygen species, mechanisms of protection against free radicals, and the effects of their action in the cell and in the body

W8 the structure and composition of the cell membrane, its transport functions and functions related to the transduction of the biological signals with examples of dysfunctions leading to the development of different diseases

W9 principles of isolation methods and quantitative and qualitative determination of proteins, enzymes, and nucleic acids

TEACHING FORMS AND METHODS:

Lecture-['W1', 'K1', 'W2', 'W3', 'K3', 'W4', 'K4', 'U4', 'W5']-Conversational lecture with the use of multimedia-Amino acids, 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.
Classes-['W1', 'U1', 'K1', 'W2', 'U2', 'K2', 'W3', 'U3', 'K3', 'K4', 'W5', 'U5', 'K5', 'U7', 'W9']-laboratory experiments-Quantitative protein identification. Electrophoresis of serum proteins. Fibrinogen release and its quantitative identification. Isolation and identification of peroxidase activity. Determining the Michaelis constant and maximum velocity for peroxidase reaction. Identifying the activity of ALT, AST, and γ-GT in blood serum. Isolation of genomic DNA from blood cells and cheek epithelium cells. Quantitative and qualitative assessment of isolated DNA. Amplification of selected DNA fragment by PCR method.
Seminar-['W1', 'K1', 'W2', 'K2', 'W3', 'K3', 'W4', 'K4', 'U4', 'W5', 'U5', 'W6', 'U6', 'W7', 'U7', 'W8']-Oral presentation on an assigned topic, multimedia presentation, discussion, case study-The major buffer systems 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.

FORM AND CONDITIONS OF VERIFYING LEARNING OUTCOMES:

Seminar-(Presentation)-['W1', 'W2', 'K2', 'K3', 'W4', 'K4', 'U4', 'W5', 'U5', 'W6', 'U6', 'W7', 'U7', 'W8']-an oral presentation of the selected problem (with multimedia support)
Seminar-(Written test)-['W1', 'K1', 'W2', 'W3', 'W4', 'U4', 'W5', 'W6', 'W7', 'W8']-written test of knowledge in the area of the problems assigned to the seminars (short test with 6 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, assignment of the correct answer or open question type with a short answer
Seminar-(Part in the discussion)-['W1', 'K1', 'W2', 'K2', 'W3', 'K3', 'W4', 'K4', 'U4', 'W5', 'U5', 'W6', 'U6', 'W7', 'U7', 'W8']-being active in discussions
Lecture-(Colloquium test)-['W1', 'K1', 'W2', 'W3', 'W4', 'U4', 'W5']-Unit tests checking the knowledge of the problems discussed in the lectures; approx. 40 questions each; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, assignment of the correct answer or open question type with a short answer.
Classes-(Written test)-['W1', 'U1', 'K1', 'W2', 'U2', 'W3', 'W4', 'U4', 'W5', 'K5', 'W9']-written test of knowledge in the area of the problems assigned to the lab classes (short test with 5 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, assignment of the correct answer or open question type with a short answer
Classes-(Report)-['U1', 'U2', 'U3']-performing analyses and preparing laboratory report

Literature:

1. ***Medical Biochemistry at a glance***, D) Salway J.G., Wiley-Blackwell, 2012, Strony: 169, Tom:1 (literatura uzupełniająca)

2. ***Lippincott Illustrated Reviews: Biochemistry***, A) Emine Ercikan Abali, Susan D. Cline, David S. Franklin, Susan M. Viselli, Wolters Kluwer, 2022, Strony: 625, Tom:1 (literatura podstawowa)

3. ***Marks' Basic Medical Biochemistry: A Clinical Approach***, B) Lieberman Michael, Alisa Peet, Wolters Kluwer, 2018, Strony: 1008, Tom:1 (literatura podstawowa)

4. ***Harper's Illustrated Biochemistry***, C) Peter J. Kennelly, Kathleen M. Botham, Owen McGuinness, Victor W. Rodwell, P. Anthony Weil, McGraw-Hill, 2023, Strony: 802, Tom:1 (literatura uzupełniająca)

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Detailed description of ECTS credits awarded - part B

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ECTS: 5.00

The number of ECTS credits awarded consists of:

1. Contact hours with the academic teacher:

- participation in:	10 h
- participation in:	35 h
- participation in:	15 h
- consultation	2 h
	Total: 62 h

2. Independent work of a student:

Preparation of reports	10.00 h
Preparation for colloquiums and written tests	35.00 h
preparation for practical classes (lab classes and seminars)	18.00 h
	Total: 63.00 h

Total (contact hours + independent work of a student): 125.00 h

1 ECTS credit = 25-30 h of an average student's work, number of ECTS,
ECTS Points = 125.00 h : 25 h/ECTS = **5.00** ECTS

Average: 5.00 ECTS

- including the number of ECTS credits for contact hours with the direct participation of an academic teacher	2.48 ECTS
- including the number of ECTS credits for hours of independent work of a student	2.52 ECTS