UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN
Faculty of Medicine

Course sylabus – part A
Biochemistry 2/2

48SJO-BIOCHE22
ECTS: 7.00
CYCLE: 2024

SUBJECT MATTER CONTENT

LECTURE
Introduction to metabolism. Glycolysis and lactic fermentation. Corich cycle. Pyruvate metabolism. Process and regulation of gluconeogenesis, glycogenogenesis and glycogenolysis. Pentose Phosphate Pathway. Process, regulation and perturbation of citric acid cycle and respiratory chain. Triacylglycerols metabolism. Oxidation and biosynthesis of fatty acids. Glycerol transformation. Ketone bodies metabolism. Complex lipids metabolism. Eicosanoids metabolism. Steroid metabolism. Metabolic turnover of proteins. Metabolism of amino acids amino groups. Urea cycle. Amino acids biosynthesis and degradation. Porphyrin metabolism. Biosynthesis and degradation of purine and pyrimidine nucleotides and perturbation in their metabolism. Integration of metabolism. Metabolic profile of organs.

SEMINAR
Obligatory problems: Glycoproteins and GAGs. Metabolism of xenobiotics and ethanol. Hormones that regulate fuel metabolism. Metabolic parameters of diabetes. Lipoproteins metabolism and atherosclerosis. Metabolic defects in amino acids metabolism. Conversion of amino acids to specialized products. Metabolism of muscle at rest and during exercise. Adipose tissue metabolism. Vitamins. Additional problems: Caloric homeostasis and body weight regulation. Anabolic steroids as a doping. The human body in extreme conditions. Biochemical basics of diseases. Between magic and medicine. Overcome the stress.

CLASSES
Quantitative identification of glucose in the blood serum. Process of protein glycation. Determination of fructosamine and HbA1c concentration in the blood. Biotransformation of sucrose to fructose 1,6-bisphosphate. TLC chromatography of carbohydrates. TLC of the brain polar lipids. Identifying total cholesterol in blood serum and cholesterol in the HDL fraction. Separation of essential oils with two-way TLC chromatography. Separation of leaf pigments with thin layer chromatography (TLC). Identification of amino acids in urine. Quantitative identification of creatinine and uric acid in blood serum. Identifying vitamin C.

TEACHING OBJECTIVE
During the course, the students are familiarised with the molecular basics of the human body functioning in physiological and pathological conditions. They master the main metabolic pathways and learn genetic and environmental factors disturbing their course with the consequences of their action. The students also learn basic laboratory methods and techniques and the equipment applied in laboratory diagnostics. They develop the ability to search for reliable information in the field of medical biochemistry.

Legal acts specifying learning outcomes: 467/2024
Disciplines: medical sciences
Status of the course: Obligatoryjny
Group of courses:A - przedmioty podstawowe
Code: ISCED 0912
Field of study: Medicine
Scope of education:
Profile of education: General academic
Form of studies: full-time
Level of studies: uniform master's studies
Year/semester: /2

Types of classes: Lecture, Seminar, Classes
Number of hours in semester: Lecture: 20.00, Seminar: 15.00, Classes: 45.00
Language of instruction: English
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.

Name of the organisational unit conducting the course: Katedra Biochemii
Person responsible for the realization of the course:dr Edyta Sienkiewicz-Szłapka
e-mail: edyta.sienkiewicz@uwm.edu.pl

Additional remarks: Protective clothing (lab coat) during the laboratory classes is required.

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_WG+++, M/NMA_P7S_ UW+++, M/NMA_P7S_UW+++, M/NMA_P7S_KO+++
Symbols for outcomes related to the field of study:	B.W13.+, K.9.+, B.U12.++, B.U6.+, B.U11.+, C.W36.+, B.W9.+, B.W11.+, A.W2.+, K.5+, B.W15.++, C.W40.+, KA7_UW5+, B.W14.+, K.10.+, D.U7.+, KA7_UU1+, K.6.+, B.W20.+, C.W29.+, KA7_UK2+, K.11.+, B.U8.++, C.W39.+

LEARNING OUTCOMES:

Knowledge:

W1 – structure, properties, types and functions of simple and complex carbohydrates, lipids and non-protein compounds containing nitrogen (amino acids and their derivatives - porphyrins, biogenic amines, melanins, creatine and nucleotides)

W2 – the course and cellular location of catabolic and anabolic pathways of metabolism of carbohydrates, lipids and nitrogen compounds, their mutual connections and mechanisms of regulation, as well as disease entities associated with their course disturbances and the molecular basis of used therapies

W3 – metabolic profiles of tissues and organs

W4 – basics of metabolism of xenobiotics and ethanol

W5 – consequences of improper nutrition on a metabolic level (long-term starvation, eating of over-caloric meals, or an unbalanced diet) and metabolic consequences of deficiency or excess of vitamins and minerals in the body

W6 – principles of methods used in the biomedical analysis in the field of disorders of the metabolism of carbohydrates, lipids and non-protein nitrogen-containing compounds

Skills:

U1 – perform isolation, identification and quantification of carbohydrates, lipids and nitrogen-containing compounds using basic laboratory techniques (e.g. spectrophotometry, chromatography)

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, interpret basic laboratory test results and identify possible causes of deviations from the norm, prepare documentation of the performed experiments

U4 – predict the direction of biochemical processes depending on the energy state of cells and based on a 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

Social competence:

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

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 – presents favorable attitude towards promotion of pro-healthy lifestyle
K5 – comply with occupational health and safety rules in the laboratory

TEACHING FORMS AND METHODS:

Lecture(W1;W2;W3;W5;U4;K1;K2;K4;):Conversational lecture with the use of multimedia
Seminar(W1;W2;W3;W4;W5;U4;U5;U6;U7;K1;K2;K3;K4;):Presenting a speech on an assigned subject, multimedia presentation, discussion, case study, debate,
Classes(W1;W6;U1;U2;U3;U7;K1;K2;K3;K4;K5;):practical laboratory exercises

FORM AND CONDITIONS OF VERIFYING LEARNING OUTCOMES:

Lecture (Colloquium test) - Unit tests checking the knowledge of problems discussed on the lectures; each about 40 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, matching the right answer or open-question type with a short answer -
Lecture (Written exam) - Final test comprising the whole program of the course - 1/2 and 2/2 (about 150 questions); (question types: BOFs, MCQs, short answer questions, computational tasks) -
Seminar (Presentation) - an oral presentation of the selected problem (with multimedia support) -
Seminar (Written test) - written checking of knowledge in the field of problems assigned to the lab classes (short test with 5 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, matching the right answer or open-question type with a short answer -
Seminar (Part in the discussion) - being active in discussions -
Classes (Written test) - written checking of knowledge in the field of problems assigned to the lab classes (short test with 5 questions; questions: closed type with one or more correct answers (BOFs/MCQs), true-false, matching the right answer or open-question type with a short answer -
Classes (Report) - performing analyses and preparing laboratory report -

BASIC LITERATURE:

1. Harvey Richard and Ferrier Denise, *Lippincott's Illustrated Reviews: Biochemistry*, Tom 1, Wyd. Wolters Kluwer I Lippincott Williams Wilkins, R. 2017, s. 551
2. Lieberman Michael, Marks Allan D., *Marks' Basic Medical Biochemistry: A Clinical Approach*, Tom 1, Wyd. Wolters Kluwer | Lippincott Williams Wilkins, R. 2018, 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*, Tom 1, Wyd. The McGraw-Hill Companies, R. 2018, s. 800
2. Salway J.G., *Medical Biochemistry at a glance*, Tom 1, Wyd. Wiley-Blackwell, R. 2012, s. 169

Detailed description of ECTS credits awarded - part B

48SJO-BIOCHE22 Biochemistry 2/2
ECTS: 7.00
CYCLE: 2024

The number of ECTS credits awarded consists of:

1. Contact hours with the academic teacher:

- participation in: Lecture	20.0 h
- participation in: Seminar	15.0 h
- participation in: Classes	45.0 h
- consultation	4.0
	Total: 84.0 h.

2. Independent work of a student:

preparation for practical classes (lab classes and seminars)	30.00 h
Preparation of reports	10.00 h
Preparation for colloquiums, written tests, and exam	51.00 h

Total: 91.0 h

contact hours + independent work of a student Total: 175.0 h

1 ECTS credit = 25-30 h of an average student’s work, number of ECTS credit = 175.0 h : 25.0 h/ECTS = 7.00 ECTS on average: 7.0 ECTS

- including the number of ECTS credits for contact hours with the direct participation of an academic teacher: 0,00 ECTS points,

- including the number of ECTS credits for hours of independent work of a student: