



Syllabus for academic year: 2021/2022													
Training cycle: 2020-2025													
Description of the course													
Course	Biochemistry							Group of detailed education results					
								Group code B	Group name SCIENTIFIC BASES OF MEDICINE				
Faculty	Dentistry												
Major	dentistry												
Level of studies	X uniform magister studies												
Form of studies	X full-time <input type="checkbox"/> part-time												
Year of studies	II						Semester:	x winter x summer					
Type of course	X obligatory												
Language of study	X English												
Number of hours													
Form of education													
	Lectures (L)	Seminars (SE)	Auditorium classes (AC)	Major Classes – not clinical (MC)	Clinical Classes (CC)	Laboratory Classes (LC)	Classes in Simulated Conditions (CSC)	Practical Classes with Patient (PCP)	Foreign language Course (FLC)	Physical Education (PE)	Vocational Practice (VP)	Directed Self-Study (DSS)	E-learning (EL)
<b>Winter semester:</b>													
Department of Biochemistry/Department of Biochemistry and Immunochemistry (Unit realizing the course)													
Direct (contact) education <sup>1</sup>			5			30							
Distance learning <sup>2</sup>	15												
<b>Summer semester:</b>													
Department of Biochemistry/Department of Biochemistry and Immunochemistry (Unit realizing the course)													

1

2



Direct (contact) education			5			30							
Distance learning	15												

**TOTAL per year:**

Department of Biochemistry/Department of Biochemistry and Immunochemistry (Unit realizing the course)													
Direct (contact) education			10			60							
Distance learning	30												

**Educational objectives (max. 6 items)**

- C1. Acquisition of the knowledge on the current medical biochemistry, with a special focus on oral cavity biochemistry.
- C2. Shaping attitudes promoting scientific reliability, by stressing the importance of precision and repeatability of laboratory measurements as well as diligence in biochemical calculations.
- C3. Development of efficiency and manual precision of, as aptitudes and abilities necessary during the work in students laboratory as well as in a future professional career as dentistry doctor.
- C4. Implementation of habits of continuous development and expanding of knowledge by self-studies

**Education result for course in relation to verification methods of the intended education result and the type of class:**

Number of detailed education result	Student who completes the course knows/is able to	Methods of verification of intended education results	Form of didactic class <i>*enter the abbreviation</i>
B.W1.	describe the role of major and trace elements in processes occurring in the body, including supply, absorption and transport;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers.  Standardized oral exams focused on the evaluation of knowledge on the level of understanding, analysis, synthesis, problem solving.	L, AC, LC
B.W2.	define the role of electrolytes, buffer systems and chemical reactions in biological systems;		
B.W3.	explain the biochemical bases of integrity of the human body;		
B.W4.	describe the structure and functions of important chemical compounds found in the human body, especially the properties, functions, metabolism and reaction enthalpy of proteins, nucleic acids, carbohydrates, lipids, enzymes and hormones;		
B.W5.	explain the principles of calcium and phosphate metabolism;		
B.U1	relate chemical phenomena to processes occurring in the oral cavity	Direct observation of the student's abilities in terms of his communication and manual skills	LC

\* L- lecture; SE- seminar; AC- auditorium classes; MC- major classes (non-clinical); CC- clinical classes; LC- laboratory classes; CSC- classes in simulated conditions; PCP- practical classes with patient; FLC- foreign language course; PE- physical education; VP- vocational practice; DSS- directed self-study; EL- E-learning



Student's amount of work (balance of ECTS points):	
Student's workload (class participation, activity, preparation, etc.)	Student Workload
1. Number of hours of direct contact:	70 (I sem – 35; II sem – 35)
2. Number of hours of distance learning:	30 (I sem – 15; II sem – 15)
3. Number of hours of student's own work:	150 (70 –I sem + 80 –II sem)
4. Number of hours of directed self-study	
Total student's workload	250
ECTS points for course	10 (4 –I sem + 6 –II sem)
<b>Content of classes:</b> (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects)	
<p><b>Lectures</b></p> <p>I. ENZYMES</p> <ol style="list-style-type: none"> <li>1. Structure and function of proteins.</li> <li>2. Enzymes – mechanisms of biocatalysis.</li> <li>3. Kinetics of enzymatic reactions.</li> <li>4. Regulation of enzymatic activity.</li> <li>5. Isoenzymes. Diagnostic significance of enzymes.</li> </ol> <p>II. OXIDATIVE PROCESSES AND TRANSPORT ACROSS MEMBRANES</p> <ol style="list-style-type: none"> <li>1. Active and passive transport across membranes.</li> <li>2. Pyruvate dehydrogenase complex. Tricarboxylic acid cycle.</li> <li>3. Respiratory chain and oxidative phosphorylation.</li> <li>4. Structure and function of cytochrome P450.</li> <li>5. Reactive oxygen species. Oxidative stress.</li> </ol> <p>III. LIPID METABOLISM</p> <ol style="list-style-type: none"> <li>1. Digestion and absorption of dietary lipids.</li> <li>2. Transport of lipids in blood plasma.</li> <li>3. Oxidation of fatty acids.</li> <li>4. Synthesis of fatty acids and triacylglycerols.</li> <li>5. Cholesterol metabolism. Atherosclerosis.</li> </ol> <p>IV. CARBOHYDRATE METABOLISM</p> <ol style="list-style-type: none"> <li>1. Digestion, absorption and transport of carbohydrates.</li> <li>2. Glycolysis and gluconeogenesis. Pentose phosphate pathway. Cori cycle.</li> <li>3. Glycogen degradation and synthesis.</li> <li>4. Fructose and galactose metabolism.</li> <li>5. Molecular mechanism of insulin, glucagon and adrenaline action.</li> </ol> <p>V. METABOLISM OF NITROGEN COMPOUNDS</p> <ol style="list-style-type: none"> <li>1. Digestion and absorption of dietary proteins. Degradation of intracellular proteins.</li> <li>2. Amino acids metabolism. Biologically active amines.</li> <li>3. Urea cycle.</li> <li>4. Degradation of purine nucleotides.</li> <li>5. Porphyrin metabolism. Diagnosis of jaundices.</li> </ol> <p>VI. FUNCTIONAL TISSUE METABOLISM</p> <ol style="list-style-type: none"> <li>1. Hormonal control of metabolism.</li> <li>2. Calcium-phosphate metabolism. Metabolism of calciferols.</li> <li>3. Iron metabolism, its regulation and disturbances.</li> <li>4. The role of the liver in overall metabolism.</li> <li>5. Biochemistry of saliva and teeth. Biochemical basis of caries development.</li> </ol>	

**Auditorium classes**

1. Biological properties of proteins – correlations between structure and function.
2. Modes of enzymes' action and their regulation.
3. Functions of biological membranes. Antioxidant mechanisms.
4. The role of tricarboxylic acid cycle and respiratory chain in energy production.
5. Plasma lipoproteins and their biomedical significance. Hormonal regulation of lipid metabolism. Metabolism of ketone bodies.
6. Carbohydrates – main energy source (glycolysis, glycogen metabolism).
7. The control of blood glucose concentration, and its disturbances leading to diabetes. Metabolism of glucose isomers.
8. General aspects of amino acids metabolism (including chosen examples).
9. Connective tissue; collagen metabolism and its disturbances.. Biochemistry of muscles..
10. Biomedical significance of vitamin D in the aspects of dentistry. The role and metabolism of fluoride

**Laboratory classes**

I laboratory section ENZYMES

1. Introductory classes. Determination of pyruvate concentration. Standard curve for pyruvate.
2. Determination of aspartate aminotransferase activity.
3. Studies on kinetics of acid phosphatase reaction.
4. Determination of horseradish peroxidase activity. Test. Credit for I laboratory section.

II laboratory section OXIDATIVE PROCESSES

1. Examination of enzymatic reaction catalyzed by succinate dehydrogenase.
2. Determination of catalase activity.
3. Quantitative determination of vitamin C. Test. Credit for II laboratory section.

III laboratory section LIPID METABOLISM

1. Hydrolysis of lipids and determination of lipase activity.
2. Determination of LDL concentration. Test. Credit for III laboratory section..
3. Determination of GGT activity. Credit for winter semester.

IV laboratory section CARBOHYDRATE METABOLISM

1. Determination of salivary amylase activity.
2. Quantitative determination of reducing sugars with Nelson method.
3. Determination of optimal pH of saccharase activity.
4. Examination of proteins glycation. Test. Credit for IV laboratory section.

V laboratory section NITROGEN METABOLISM

1. Quantitative determination of proteins using Biuret method.
2. Determination of isoelectric point of protein.
3. Quantitative determination of creatinine. Test. Credit for V laboratory section.

VI laboratory section BIOCHEMISTRY OF CONNECTIVE TISSUE, TEETH AND SALIVA

1. Determination of calcium concentration.
2. Determination of phosphate concentration. Test. Credit for VI laboratory section.
3. Determination of hemoglobin and its derivatives. Credit for summer semester.

**Basic literature**

1. Richard A. Harvey et al. "Lippincot's Illustrated Reviews: Biochemistry, 7<sup>th</sup> edition, 2017"
2. Robert K. Murray et al. "Harper's Biochemistry", 31<sup>st</sup> edition

**Additional literature and other materials**

1. 1. Thomas M. Devlin „Biochemistry with Clinical Correlations”, Willey-Liss, New York
- 2.. Michael Lieberman, Allan D. Marks “Mark’s Basic Medical Biochemistry: A Clinical Approach”. Fourth Edition
3. L. Baynes., M. Dominiczak, „Medical Biochemistry”, Mosby Elsevier, Third Edition

**Preliminary conditions:**

A credit in molecular biology, medical chemistry and biophysics from the first year of studies

**Conditions for participation in the final exam**

**Credit**

1. Proper execution of laboratory classes and preparation of reports summarizing the obtained data, correct calculations and conclusions
2. Active participation in auditorium classes – analysis and solving scientific problems and active participation in discussion.
3. Obtaining positive grades from tests covering material concerning the whole



	material covered in a course of biochemistry .
	4. <u>Each absence</u> must be made up, including justified absences, rector's days or dean's hours, in a manner indicated by a person supervising the classes in agreement with a person responsible for the subject.

Grade:	Criteria for the exam grades <sup>3</sup>
Very Good (5.0)	≥ 93% of correct answers
Good Above (4.5)	≥ 85% of correct answers
Good (4.0)	≥ 77% of correct answers
Satisfactory Plus (3.5)	≥ 69% of correct answers
Satisfactory (3.0)	≥ 60% of correct answers

Unit realizing the course:	Department of Biochemistry, Department of Biochemistry and Immunochemistry
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List of persons conducting specific classes:				
Name and surname	Degree/scientific or professional title	Discipline	Performed profession	Form of classes
Małgorzata Krzystek-Korpaczka	Professor dr hab. of Medical Sciences	Medical sciences and health sciences	Academic teacher (professor), biochemist	AC, LC
Małgorzata Matusiewicz	Doctor hab. of Medical Sciences	Medical sciences and health sciences	Academic teacher (senior lecturer) biochemist	L, AC, LC
Iwona Bednarz-Misa	Doctor of Medical Sciences, specialist in medical laboratory diagnostics	Medical sciences and health sciences	Academic teacher (adjunct), laboratory diagnostician, biochemist	AC, LC
Izabela Berdowska	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (adjunct), biochemist	L, AC, LC
Mariusz Bromke	Doctor of Natural Sciences	Medical sciences and health sciences	Academic teacher (adjunct), biochemist	AC, LC
Agnieszka Bronowicka-Szydełko	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (adjunct), laboratory diagnostician, biochemist	AC, LC
Ireneusz Ceremuga	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (senior lecturer) laboratory diagnostician, biochemist	AC, LC
Magdalena Mierzchała-Pasierb	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (adjunct), biochemist	AC, LC



Paweł Serek	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (assistant) laboratory diagnostician,	AC, LC
Ewa Seweryn	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (adjunct), biochemist	AC, LC
Kamilla Stach	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (assistant), biochemist	AC, LC
Izabela Szczuka	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (assistant), biochemist	AC, LC
Łukasz Kotyra	Physician	Medical sciences and health sciences	Ph.D. student	LC

Date of Syllabus development

18.06.2021.

Syllabus developed by

Małgorzata Matusiewicz

Signature of Head(s) of teaching unit(s)

Dean's signature

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