Appendix
to Resolution No. 2186
of Senate of Wroclaw Medical University
of 1 July 2020

Syllabus for academic year: 2020/2021 Training cycle: 2019-2024			
Description of the course			
Module/Course	Biochemistry	Group of detailed education results B	
		Group code B	Group name **Scientific principles of medicine**
Faculty	Medical Dentistry		
Major	Medical Dentistry		
Unit realizing the subject	Dept. of Medical Biochemistry		
Specialties	Not applicable		
Level of studies	Uniform magister studies X* 1st degree studies ☐ 2nd degree studies ☐ 3rd degree studies ☐ postgraduate studies ☐		
Form of studies	X full-time X part-time		
Year of studies	II	Semester	X Winter X Summer
Type of course	X obligatory ☐ limited choice ☐ free choice / elective		
Course	☐ major X basic		
Language of instruction	☐ Polish X English ☐ other		
* mark ☐ with an X			

Number of hours

Form of education

Unit teaching the course	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)	Specialist Classes – magister studies (SCM)	Foreign language Course (FLC)	Physical Education obligatory (PE)	Vocational Practice (VP)	Self-Study (Student's own work)	E-learning (EL)
Winter Semester														
Direct (contact) education						15								
Online learning (synchronous)	15		5			15								
Distance learning (asynchronous)														

Summer Semester														
Direct (contact) education						15								
Online learning (synchronous)	15		5			15								
Online learning (asynchronous)														
TOTAL per year:														
Direct (contact) education						30								
Online learning (synchronous)	30		10			30								
Online learning (asynchronous)														

Educational objectives (max. 6 items)

C1. Acquisition of the knowledge on the metabolism of the main groups of chemical compounds in physiological and pathological conditions, with reference to biochemical processes within oral cavity.
C2. Understanding the processes leading to the diversion of normal into pathological biochemical pathways, including molecular basis of caries and other chosen disorders development.
C3. Acquaintance with the basic scientific techniques applied in biochemistry.
C4. Familiarity with the analysis and interpretation of the results obtained in biochemical experiments (calculations, graphs analysis etc.).
C5. The formation of an essential biochemical foundation for further insight into molecular processes in pathological conditions and the possibilities of their regulation, in the subsequent stages of medical education and professional career as a dentist.

Education result matrix for module/course in relation to verification methods of the intended education result and the type of class

Number of course education result	Number of major education result	Student who completes the module/course knows/is able to	Methods of verification of intended education results (forming and summarising)	Form of didactic class ***enter the abbreviation*
W.01.	**B.W.1**	Student: Describes the role of macro and microelements in the processes taking place in the organism taking into account their supply, absorption and transport	Written exams with a defined time regime, in a form of multiple choice tests, 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. Written tests in a form of short essays, reports, short structured question Oral exams with and without the access to textbooks.	**L** **AC** LC
W.02.	**B.W.2**	Defines the significance of electrolytes, buffering systems and chemical reactions in biological systems. .		
W.03.	**B.W.3**	Explains biochemical foundations of human organism integrity.		
W.04.	**B.W.4**	Describes structure and function of important chemical compounds existing in human organism, especially properties, functions, metabolism and reaction energetics of: proteins, nucleic acids, carbohydrates, lipids, enzymes and hormones.		

W.05. **W.06.** **W.07.**	**B.W.5** **B.W.6** **B.W.22**	Defines the principles of calcium-phosphate metabolism. Explains the role and significance of body fluids, including saliva Describes principles of metabolism and nutrition	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present scientific issues	
U 01 U 02 U 03 U 04	**B.U1** **B.U4** **B.U5**	Connects biochemical phenomena with the processes occurring in the oral cavity. Uses biochemical, biological and ecological concepts in the context: humans – living environment Applies the knowledge from the area of biochemistry, genetics and molecular biology in the clinical practice. Critically evaluates the results of scientific studies and adequately justifies his/her position	Direct observation and evaluation of student's manual skills and his abilities of solving assignments	AC LC
K 01 K 02 K 03		Applies unbiased sources of information. Formulates conclusions from his/her own measurements or observations Collaborates in a multicultural and multinational group	Direct observation of student's scientific activities and his abilities of social communications , especially in a multicultural and multinational group	**L** **AC** LC

** L - lecture; SE - seminar; AC – auditorium classes; MC – major classes (non-clinical); CC – clinical classes; LC – laboratory classes; SCM – specialist classes (magister studies); CSC – classes in simulated conditions; FLC – foreign language course; PCP practical classes with patient; PE – physical education (obligatory); VP – vocational practice; SS – self-study, EL – E-learning .

Please mark on scale 1-5 how the above effects place your classes in the following categories: communication of knowledge, skills or forming attitudes:
Knowledge: 5
Skills: 5
Social competences: 5

Student's amount of work (balance of ECTS points)	
Student's workload (class participation, activity, preparation, etc.)	Student Workload (h)
1. Contact hours:	30
2. Online learning hours (e-learning):	70
3. Student's own work (self-study):	140
Total student's workload	240
ECTS points for module/course	8
Comments	

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Content of classes (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects)

Lectures

I. ENZYMES
1. Structure and function of proteins.
2. Enzymes – mechanisms of biocatalysis.
3. Kinetics of enzymatic reactions.
4. Regulation of enzymatic activity.
5. Isoenzymes. Diagnostic significance of enzymes.

II. OXIDATIVE PROCESSES AND TRANSPORT ACROSS MEMBRANES
1. Active and passive transport across membranes.
2. Pyruvate dehydrogenase complex. Tricarboxylic acid cycle.
3. Respiratory chain and oxidative phosphorylation.
4. Structure and function of cytochrome P450.
5. Reactive oxygen species. Oxidative stress.

III. LIPID METABOLISM
1. Digestion and absorption of dietary lipids.
2. Transport of lipids in blood plasma.
3. Oxidation of fatty acids.
4. Synthesis of fatty acids and triacylglycerols.
5. Cholesterol metabolism. Atherosclerosis.

IV. CARBOHYDRATE METABOLISM
1. Digestion, absorption and transport of carbohydrates.
2. Glycolysis and gluconeogenesis. Pentose phosphate pathway. Cori cycle.
3. Glycogen degradation and synthesis.
4. Fructose and galactose metabolism.
5. Molecular mechanism of insulin, glucagon and adrenaline action.

V. METABOLISM OF NITROGEN COMPOUNDS
1. Digestion and absorption of dietary proteins. Degradation of intracellular proteins.
2. Amino acids metabolism. Biologically active amines.
3. Urea cycle.
4. Degradation of purine nucleotides.
5. Porphyrin metabolism. Diagnosis of jaundices.

VI. FUNCTIONAL TISSUE METABOLISM
1. Hormonal control of metabolism.
2. Calcium-phosphate metabolism. Metabolism of calciferols.
3. Iron metabolism, its regulation and disturbances.
4. The role of the liver in overall metabolism.
5. Biochemistry of saliva and teeth. Biochemical basis of caries development.

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

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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 (list according to importance, no more than 3 items)

1. Richard A. Harvey et al. “Lippincot’s Illustrated Reviews: Biochemistry”
2. Robert K. Murray et al. "Harper's Biochemistry"

Additional literature and other materials (no more than 3 items)

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

Didactic resources requirements (e.g. laboratory, multimedia projector, other…)

1. Biochemical laboratories, seminar rooms, lecture hall.
2. Laboratory equipment - spectrophotometers, centrifuges, incubators, water baths, dryers, laboratory scales, electrophoresis apparatuses, power suppliers, microwave ovens, glassware and laboratory plastics, automatic pipettes, thermoblocks, lyophilisators, refrigerators, freezers.
3. Chemical reagents, protein standards, kits dedicated to colorimetric determination of biochemical parameters, biological material, distilled water.

4. Audio-visual equipment - multimedia projectors, computers, etc.

Preliminary conditions (minimum requirements to be met by the student before starting the module/course)

Student should know the principles of chemistry and biology and have molecular biology, medical chemistry and biophysics courses completed (at the university level).

Conditions to receive credit for the course (specify the form and conditions of receiving credit for classes included in the module/course, admission terms to final theoretical or practical examination, its form and requirements to be med by the student to pass it and criteria for specific grades)

Classes in biochemistry are divided into 6 thematical sections - 3 sections in each semester. Each section encompasses 3-4 laboratory classes and 1-2 auditorium classes. Each semester ends with a test checking the acquired knowledge.

Requirements for getting a credit and be able to participate in final exam:

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. Each absence 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.

Final exam

1. First term of the final exam is in the written form - a test consisting of both single-choice and open questions..
2. Retake exams are conducted in written or oral form.

Grade:	**Criteria** (only for courses/modules ending with an examination)
Very Good (5.0)	Not applicable
Good Plus (4.5)	Not applicable
Good (4.0)	Not applicable
Satisfactory Plus (3.5)	Not applicable
Satisfactory (3.0)	Not applicable
	Criteria (only for courses/modules ending with e credit)
Credit	1. Obtaining the credit for all laboratory classes. 2. Active participation in auditorium classes. 3. Obtaining positive grades from all tests.

Grade:	**Criteria** (examination evaluation criteria)
Very Good (5.0)	≥ 93% of exam maximal points
Good Plus (4.5)	≥ 85% of exam maximal points
Good (4.0)	≥ 77% of exam maximal points
Satisfactory Plus (3.5)	≥ 69% of exam maximal points
Satisfactory (3.0)	≥ 60% of exam maximal points

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Unit realizing the subject	Dept. of Medical Biochemistry
Unit address	Chałubińskiego 10, 50-368 Wrocław
Telephone	71 784-13-70
E-Mail	wl-4@umed.wroc.pl

Person responsible for module	Dr hab. Małgorzata Matusiewicz
Coordinator	Dr hab. Małgorzata Matusiewicz
Telephone	71 784-13-96
E-Mail	malgorzata.matusiewicz@umed.wroc.pl

List of persons conducting specific classes

Full name	Degree/scientific or professional title	Discipline	Performed profession	Form of classes
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
Łukasz Kotyra	Physician	Medical sciences and health sciences	Ph.D. student	LC
Małgorzata Krzystek-Korpacka	Doctor 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
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
Bogdan Zieliński	Doctor of Medical Sciences	Medical sciences and health sciences	Academic teacher (adjunct), biochemist	AC, LC

Date of Syllabus development

24.09.2020

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Syllabus developed by

Dr hab. Małgorzata Matusiewicz

Signature of Head of teaching unit

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Signature of Faculty Dean

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