



TOTAL per year:																			
100	30	10				60													

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 <i>**enter the abbreviation</i>
W.01.	B.W.11	Student: Describes the structure of lipids and polysaccharides, and understands their functions within intracellular and extracellular structures;	test, presentation, discussion, report, written examination	WY AC CL SK
W.02.	B.W.12	Knows primary, secondary, tertiary and quaternary structures of proteins; knows posttranslational and functional protein modifications and their significance;		
W.03.	B.W.15	Describes the basic catabolic and anabolic pathways, the modes of their regulation, and explains the impact of genetic and environmental factors;		
W.04.	B.W.16	Understands and compares metabolic profiles of the basic organs and systems;		
W.05	B.W.18	Distinguishes the enzymes involved in digestion, the mechanism of hydrochloric acid generation in the stomach, the role of the bile, the process of the absorption of digestion products, and its disturbances;		



W.06.	B.W.19	Explains medical consequences of an improper diet including the intake of excess-carbohydrates meals; also with respect to oral cavity;		
W.07.	B.W.20	Knows the consequences of vitamins and minerals deficiency or excess in the organism;		
W.08.	B.W.21	Defines the biochemical pathways of the communication between cells, as well as signal transduction pathways in the cell, and gives the examples of disturbances in these processes resulting in the onset of various diseases;		
W.09.	B.W.26	Knows biochemical mechanisms of hormones actions, and the consequences of disturbances in hormonal regulation;		
U1	B.U3	Student Indicates the relation between factors disturbing the equilibrium of biological processes, and physiological/pathophysiological changes.	test, presentation, discussion, report, written examination	WY AC CL SK
U2	B.U4	Performs simple biochemical calculations (calculates molar and per cent concentrations of compounds).		
U3	B.U7	Can foresee the direction of biochemical processes on the basis of the energetic status of the cell;		
U4	B.U8	Describes biochemical changes in the organism functioning in the situation of homeostasis disturbance, especially defines its biochemical response to physical exercise, exposition to high or low temperature, the loss of blood or water;		
U5	B.U10	Uses basic laboratory techniques such as quality analysis, titration, spectrophotometry, pH measurements, chromatography, electrophoresis of proteins and nucleic acids, applied in biochemistry;		
U6	B.U11	Uses simple measurement utilities applied in biochemistry, and evaluates the precision of the performed measurements;		
U7	B.U12	Uses biochemical data bases including the Internet ones, and is able to search for the required information with the aid of the available tools.		
K 01		Student Demonstrates appropriate attitude and honesty in task performance;	test, presentation, discussion, report, written examination	WY AC CL SK
K 02		Understands that knowledge from basic biological sciences should be permanently completed and updated to meet the requirements of the employment market.		
K 03		Eagerly participates in problems solving and collaborates in a group during the performance of simple scientific investigations, and interpretation of their results.		

** 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:	I sem 30+15+5= 50 II sem 30+15+5= 50 All: 100 hours
2. Student's own work (self-study):	I sem = 70; II sem = 100, All: 170 hours
Total student's workload	270
ECTS points for module/course	9 (I sem 4+ II sem 5)
Comments	
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)	
<p>Lectures</p> <p>I. ENZYMES</p> <ol style="list-style-type: none"> (1h) Structure and function of proteins. (1h) Enzymes – mechanisms of biocatalysis. Kinetics of enzymatic reactions. (1h) Regulation of enzymatic activity (allosteric, covalent). (1h) Regulation of metabolism by kinases – mechanism of hormones action. (1h) Isoenzymes. Diagnostic significance of enzymes. <p>II. OXIDATIVE PROCESSES AND TRANSPORT ACROSS MEMBRANES</p> <ol style="list-style-type: none"> (1h) Active and passive transport across membranes. (1h) Pyruvate dehydrogenase complex. Tricarboxylic acid cycle. (1h) Respiratory chain and oxidative phosphorylation. (1h) Structure and function of cytochrome P450. (1h) Reactive oxygen species. Oxidative stress. <p>III. LIPID METABOLISM</p> <ol style="list-style-type: none"> (1h) Digestion and absorption of dietary lipids. (1h) Transport of lipids in blood plasma. (1h) Oxidation of fatty acids. (1h) Synthesis of fatty acids and triacylglycerols. (1h) Cholesterol metabolism. Atherosclerosis. <p>IV. CARBOHYDRATE METABOLISM</p> <ol style="list-style-type: none"> (1h) Digestion, absorption and transport of carbohydrates. (1h) Glycolysis and gluconeogenesis. Pentose phosphate pathway. Cori cycle. (1h) Glycogen degradation and synthesis. (1h) Fructose and galactose metabolism. (1h) Molecular mechanism of insulin, glucagon and adrenaline action. <p>V. METABOLISM OF NITROGEN COMPOUNDS</p> <ol style="list-style-type: none"> (1h) Digestion and absorption of dietary proteins. Degradation of intracellular proteins. (1h) Amino acids metabolism. Biologically active amines. (1h) Urea cycle. (1h) Degradation of purine nucleotides. 	



5. (1h) Porphyrin metabolism. Diagnosis of jaundices.

VI. FUNCTIONAL TISSUE METABOLISM

1. (1h) Hormonal control of metabolism.
2. (1h) Connective tissue; collagen metabolism and its disturbances.
3. (1h) Calcium-phosphate metabolism. Metabolism of calciferols.
4. (1h) Iron metabolism, its regulation and disturbances.
5. (1h) Biochemistry of saliva and teeth. Biochemical basis of caries development.

Auditorium classes

1. (1h) The functions of enzymes.
2. (1h) Biological properties of proteins.
3. (1h) General aspects of amino acids metabolism (including chosen examples).
4. (1h) Transport of lipids in lymph and plasma. Atherosclerosis – diagnostic significance of TAG, LDL, HDL measurements.
5. (1h) Hormonal regulation of lipid metabolism. Metabolism of ketone bodies.
6. (1h) Carbohydrates – main energy source (glycolysis, glycogen metabolism).
7. (1h) The control of blood glucose concentration, and its disturbances leading to diabetes. Metabolism of fructose.
8. (1h) The role of tricarboxylic acid cycle and respiratory chain in energy production.
9. (1h) Transport across membranes.
10. (1h) Biochemistry of muscles. Metabolic functions of the liver.

Practical classes

I laboratory section ENZYMES

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

II laboratory section OXIDATIVE PROCESSES

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

III laboratory section LIPID METABOLISM

1. (3h) Hydrolysis of lipids and determination of lipase activity.
2. (3h) Determination of LDL concentration. Credit for III laboratory section.
3. (3h) Determination of GGT activity. Semestral lab exam. Credit for winter semester.

IV laboratory section CARBOHYDRATE METABOLISM

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

V laboratory section NITROGEN METABOLISM

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



VI laboratory section BIOCHEMISTRY OF CONNECTIVE TISSUE, TEETH AND SALIVA

1. (3h) Determination of calcium concentration.
2. (3h) Determination of phosphate concentration. Credit for VI laboratory section.
3. (3h) Determination of hemoglobin and its derivatives. Semestral lab exam. Credit for summer semester.

Other

- 1.
 - 2.
 - 3.
- etc. ...

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

1. Richard A. Harvey et al. "Lippincot's Illustrated Reviews: Biochemistry"
2. Michael Lieberman, Allan D. Marks "Mark's Basic Medical Biochemistry: A Clinical Approach", Fourth Edition
3. 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. D.L. Nelson, M.M. Cox “Lehninger Principles of Biochemistry”, Sixth Edition
3. L. Baynes., M. Dominiczak, „Medical Biochemistry”, Mosby Elsevier, Third Edition

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

1. Laboratories, seminar rooms, lecture halls.
2. Laboratory utilities; water baths, centrifuges, incubators, spectrophotometers, glassware, pipettes, chemical reagents
3. Multimedia projectors, computers, whiteboards.

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 met by the student to pass it and criteria for specific grades)

In order to obtain a credit for biochemistry it is compulsory to get a credit for all thematic sections:

1. Properly conduct the experiments designed in the course plan and present reports summarizing the obtained data, calculations and conclusions.
2. Actively participate in auditorium classes – analyze and solve scientific problems and actively participate in discussion.
3. Obtain a positive grade for all laboratory exams covering both theoretical and practical material.

A credit for all the laboratory sections is a prerequisite for participation in the final exam in biochemistry.

Final exam is in the form of a test consisting of both single-choice and open questions. To pass the exam the student should obtain more than 50% from each of the parts (single-choice and open questions). Percentage of correct answers required to obtain specific grades is given below:



Grade:	Criteria (only for courses/modules ending with an examination)
Very Good (5.0)	Above 90%
Good Plus (4.5)	Above 80%
Good (4.0)	Above 70%
Satisfactory Plus (3.5)	Above 60%
Satisfactory (3.0)	Above 50%

Name and address of module/course teaching unit, contact: telephone and e-mail address

Department of Medical Biochemistry, Chałubińskiego 10, 50-368 Wrocław
Secretarial office: e-mail: wl-4@umed.wroc.pl; phone: 784-13-70

Coordinator / Person responsible for module/course, contact: telephone and e-mail address

Dr Małgorzata Matusiewicz; phone: 784-13-96; malgorzata.matusiewicz@umed.wroc.pl

List of persons conducting specific classes: full name, degree/scientific or professional title, discipline, performed profession, form of classes.

Teachers	Degree, field of science, profession	Form of classes
Iwona Bednarz-Misa	Doctor of Medical Sciences, Biochemist, Laboratory diagnostician, adjunct	Laboratories, auditorium classes
Izabela Berdowska	Doctor of Medical Sciences, Biochemist, adjunct	Lectures
Ireneusz Ceremuga	Doctor of Medical Sciences, Biochemist, adjunct	Laboratories, auditorium classes
Małgorzata Matusiewicz	Doctor of Medical Sciences, Biochemist, senior lecturer	Lectures, laboratories, auditorium classes
Magdalena Mierzchała-Pasierb	Doctor of Medical Sciences, Biochemist, adjunct	Laboratories, auditorium classes
Ewa Seweryn	Doctor of Medical Sciences, Biochemist, adjunct	Laboratories, auditorium classes
Bogdan Zieliński	Doctor of Medical Sciences, Biochemist, adjunct	Lectures

Date of Syllabus development

30.06.2017

Syllabus developed by

Dr Małgorzata Matusiewicz

Signature of Head of teaching unit

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Signature of Faculty Dean

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