



### Syllabus for academic year: 2023/24

#### Description of the course

<b>Course</b>	Biochemia z elementami chemii (1)	<b>Group of detailed education results</b>	
	Biochemistry with elements of chemistry (1)	<b>Group of classes (group code):</b> B	<b>Group name:</b> Scientific basis of medicine
<b>Faculty</b>	Faculty of Medicine		
<b>Major</b>	English Division - Faculty of Medicine		
<b>Level of studies</b>	uniform MA studies		
<b>Form of studies</b>	full-time		
<b>Year of studies</b>	1	<b>Semester of studies</b>	zimowy, letni
<b>Type of course</b>	obligatory		
<b>Language of study</b>	English		

#### Number of hours

##### Form of education

	(L)	(SE)	(AC)	(MC)	(CC)	(LC)	(CSC)	(PCP)	(FLC)	(PE)	(VP)	(DSS)	(EL)
<b>Semestr zimowy:</b>													
Katedra Biochemii i Immunochemii:	14					24							
Kształcenie bezpośrednie:	0					24							
Kształcenie zdalne:	14					0							
<b>Semestr letni:</b>													
Katedra Biochemii i Immunochemii:	15	15				32							
Kształcenie bezpośrednie:	0	15				32							
Kształcenie zdalne:	15	0				0							
<b>Razem w roku:</b>													
Katedra Biochemii i Immunochemii:	29	15				56							
Kształcenie bezpośrednie:	0	15				56							
Kształcenie zdalne:	29	0				0							

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)

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

C1: Provide the students with the knowledge on the structure, properties, function and metabolic processes of the basic groups of chemical compounds in norm and pathology

C2: Equip the students with the abilities of performing biochemical calculations and of interpretation of the results of conducted experiments

C3: Familiarize students with the basic scientific techniques applied in biomedical studies

C4: Creation of biochemical foundations enabling the students to gain in-depth understanding of molecular mechanisms underlying various disorders, important in subsequent stages of medical education as well as in a future professional career as medical doctor.

C5: Shaping attitudes promoting scientific reliability, by stressing the importance of precision and repeatability of laboratory measurements as well as diligence in biochemical calculations and development of efficiency and manual precision as aptitudes and abilities necessary during the work in students laboratory as well as in a future professional career as medical doctor.

C6: Development social competences needed to practice the medical profession, in accordance with graduate's profile.

**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
B.W1.	the water-mineral balance of biological systems;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, CL, SE
B.W2.	the acid-base balance and the mechanism of action of buffers and their importance in body homeostasis;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, CL, SE
B.W3.	the terms: solubility, osmotic pressure, isotonia, colloidal solutions and Gibbs-Donnan effect;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, CL, SE
B.W4.	the basic reactions of inorganic and organic compounds in aqueous solutions;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, CL, SE

B.W10.	the structure of simple organic compounds that make up the macromolecules present in cells, the extracellular matrix and body fluids;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W11.	the structure of lipids and polysaccharides and their functions in cellular and extracellular structures;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W12.	the I-, II-, III- and IV-order structures of proteins and post-translational and functional modifications of proteins and their significance;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W13.	the function of nucleotides in the cell, the I- and II-order structures of DNA and RNA, and the structure of chromatin;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W14.	the functions of the human genome, transcriptome and proteome and the principal methods used to study them, the processes of DNA replication, repair and recombination, transcription and translation and the degradation of DNA, RNA and proteins, and the concepts of regulation of gene expression;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W15.	the basic catabolic and anabolic pathways, how they are regulated, and how they are influenced by genetic and environmental factors;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W16.	the metabolic profiles of key organs and systems;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL

B.W17.	the ways in which cells communicate with each other and with the extracellular matrix, and the pathways for transmitting signals within the cell, and examples of disruption of these processes leading to cancer and other diseases;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W18.	the processes: cell cycle, proliferation, differentiation and ageing of cells, apoptosis and necrosis and their significance for the functioning of an organism;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W20.	the basics of stimulation and conduction in the nervous system and higher nervous functions, as well as striated and smooth muscle physiology and blood functions;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W23.	the body's ageing mechanism;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W25.	the relationship between factors disturbing the equilibrium state of biological processes and physiological and pathophysiological changes;	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.W29.	the principles of scientific, observational and experimental research and in vitro studies for the development of medicine.	Written exams in a form of MCQ, MRQ tests, a choice of yes/no answers, matching answers, with open questions. 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 questions.	WY, SE, CL
B.U3.	calculate the molar and percentage concentrations of compounds and the concentrations of substances in iso-osmotic, mono- and multi-component solutions;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL
B.U4.	calculate the solubility of inorganic compounds, determine the chemical basis of the solubility or lack thereof of organic compounds and its practical significance for dietetics and therapeutics;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL

B.U5.	determine the pH of a solution and the effect of changes in pH on inorganic and organic compounds;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL
B.U6.	predict the direction of biochemical processes in relation to the energy state of cells;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL
B.U8.	use basic laboratory techniques such as qualitative analysis, titration, colorimetry, pH monitoring, chromatography, electrophoresis of proteins and nucleic acids;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL
B.U9.	operate simple measuring instruments and assess the accuracy of the taken measurements;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL
B.U10.	use databases, including online databases, and search for required information using the available tools;	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	SE
B.U13.	plan and carry out simple scientific research, interpret the results and draw conclusions from them.	Direct observation and evaluation of the student's manual performance, his abilities to solve problems, and abilities to prepare and present presentations on the indicated scientific topics.	CL
K.5	notice and recognise one's own limits and to self evaluate and identify educational deficits and needs	Direct observation of the student's researchactivity during practical laboratorydeterminations and his social communicationskills, including in a multicultural group.	CA, CL
K.7	use objective sources of information	Direct observation of the student's researchactivity during practical laboratorydeterminations and his social communicationskills, including in a multicultural group.	CA, CL
K.8	formulate conclusions based on own measurements or observations	Direct observation of the student's researchactivity during practical laboratorydeterminations and his social communicationskills, including in a multicultural group.	CL
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>Student's amount of work</b>	
<b>(balance of ECTS points):</b>	
Student's workload (class participation, activity, preparation, etc.)	<b>Student Workload</b>

1. Number of hours of direct contact:	71
2. Number of hours of distance learning:	29
3. Number of hours of student's own work:	48
4. Number of hours of directed self-study	0
Total student's workload:	148
<b>ECTS points for course:</b>	8

**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:**

1. Acid-base balance of the organism and buffer systems. 2. Amino acids, peptides, proteins - connections between structure and function, disorders - part 1. 3. Amino acids, peptides, proteins - connections between structure and function, disorders - part 2. 4. Amino acids, peptides, proteins - connections between structure and function, disorders - part 3. Amyloid diseases as disorders in protein folding. 5. Enzymes - part 1. 6. Enzymes - part 2. 7. Enzymes - part 3. 8. Enzymes - part 4. Metabolism of information - part 1. 9. Metabolism of information - part 2. 10. Metabolism of information - part 3. 11. Metabolism of information - part 4. 12. Digestion and absorption of proteins. Metabolism of nitrogenous and heterocyclic compounds, disturbances - part 1. 13. Metabolism of nitrogenous and heterocyclic compounds, disturbances - part 2. 14. Metabolism of nitrogenous and heterocyclic compounds, disturbances - part 3. 15. Lipids - connections between structure and function. Digestion, absorption and transport of lipids - part 1. 16. Digestion, absorption and transport of lipids - part 2. 17. Digestion, absorption and transport of lipids - part 3. 18. Metabolism of lipids, regulation and disturbances - part 1. 19. Metabolism of lipids, regulation and disturbances - part 2. 20. Metabolism of lipids, regulation and disturbances - part 3. 21. Carbohydrates. Glycoconjugates - connections between structure and function, disorders. 22. Digestion and absorption of carbohydrates. Carbohydrates' transporters. 23. Glucose metabolism, regulation and disturbances - part 1. 24. Glucose metabolism, regulation and disturbances - part 2. 25. Glucose metabolism, regulation and disturbances - part 3. 26. Metabolism of fructose and galactose, regulation and disturbances. Biochemical background of cardiometabolic diseases - obesity, insulin resistance, diabetes, cardio-vascular diseases - part 1. 27. Biochemical background of cardiometabolic diseases - obesity, insulin resistance, diabetes, cardio-vascular diseases - part 2. 28. Biochemical background of cardiometabolic diseases - obesity, insulin resistance, diabetes, cardio-vascular diseases - part 3. 29. Biochemical background of cardiometabolic diseases - obesity, insulin resistance, diabetes, cardio-vascular diseases - part 4.

**Seminars:**

1. Metabolism of lipids, regulation and disturbances - part 1. 2. Metabolism of lipids, regulation and disturbances - part 2. 3. Metabolism of lipids, regulation and disturbances - part 3. 4. Metabolism of carbohydrates, regulation and disturbances - part 1. 5. Metabolism of carbohydrates, regulation and disturbances - part 2. 6. Metabolism of carbohydrates, regulation and disturbances - part 3. 7. Biochemical background of cardiometabolic diseases - part 1. 8. Biochemical background of cardiometabolic diseases - part 2.

**Classes::**

1. Principles of the work in a laboratory and safety instructions. Solutions - composition of body fluids. 2. Measurement errors. Biochemistry calculations - part 1. 3. TEST I. Biochemistry calculations - part 2. 4. Reliability of experimental results. 5. Kinetics of enzymatic reaction, part 1: Km and Vmax determination; effects of inhibitors on reaction course. 6. Kinetics of enzymatic reaction, part 2: effect of environmental conditions on reaction course. 7. TEST II. Biochemistry calculations - part 3. 8. Systemic buffers. Blood pH, acidosis, alkalosis. Amino acids - connections between amino acids composition and protein properties and function - part 1. 9. TEST III. Biochemistry calculations - part 4. 10. Second term of tests I, II and III. Amino acids - connections between amino acids composition and protein properties and function - part 2. 11. Analysis of oxidative stress parameters - part 1. 12. Analysis of oxidative stress parameters - part 2. 13. TEST IV. Biochemistry calculations - part 5. 14. Preparation of standard curves. 15. Glycogen degradation. 16. TEST V. Biochemistry calculations - part 6. 17. Properties of globular proteins. 18. Modern methods of analysis. 19. Test VI. Determination of CRP. Biochemistry calculations - part 7. 20. Second term of tests IV, V and VI. 2. Determination of creatinine, LDL and albumin.

**Other:**

Consultations

**Basic literature**

Richard A. Harvey et al. "Lippincot's Illustrated Reviews: Biochemistry" VIII Edition, 2021; ISBN-13: 978-1975155063 ; ISBN-10: 1975155068

**Additional literature and other materials:**

1. Robert K. Murray et al. "Harper's Biochemistry" 31st edition; 2018; ISBN10 1259837939; ISBN13 9781259837937. 2. Thomas M. Devlin „Biochemistry with Clinical Correlations”, 7th edition; Willey-Liss, New York; ISBN: 978-0-470-28173-4. 3. L. Baynes., M. Dominiczak, „Medical Biochemistry”, Mosby Elsevier, 5th Edition, 2018; ISBN: 9780702072994 ; eBook ISBN: 9780702073007

**Preliminary conditions:**

The student should know the fundamentals of chemistry and biology at the high school level.

**Rules for granting partial grades in the subject during the semester:**

Obtaining positive grades from all tests scheduled in a course (3 tests in a semester) conducted either in written or oral form and encompassing designated material covered during lectures, seminars and laboratories as well as based on student's own work from the specified literature. Only the answers from those indicated sources will be considered as the correct ones. To get a credit for a test a Student needs to obtain at least 60% of possible to obtain points, with the reservation, that the criteria for obtaining a credit for a particular test can change (exclusively in favor of Students) after the analysis of the degree of difficulty of a given test. The tests are composed of test questions part (MCQ, MRQ tests) and open questions part that requires completing a task, for example, writing/completing the reaction, diagram, table, graph, description of a mechanism of action, giving examples or traits, calculating the values, etc. Additionally these partial tests will contain 1-2 additional questions from the detailed knowledge, points obtained from these questions will be added to the points of the test, enabling a Student to get >100% of points, with the reservation that the maximal number of points possible to obtain cannot exceed 10% of the maximal number of test points. In a case when a Student will not get a credit for a given section it is required to retake the test at the indicated date. Retake of the test can be in the written or oral form depending on the number of Students. The final grade from a given test is an average of points obtained in all the terms.

The tests are conducted in the direct contact with teacher. In exceptional situations, by the decision of the University Authorities, they can be conducted in a remote form.

### **Conditions to receive credit for the course:**

1. Proper completing of laboratory classes and preparation of reports summarizing the obtained data, containing correct calculations and conclusions from the conducted experiments. 2. Active participation in seminar classes – analyzing and solving scientific problems and involvement in preparation of scientific presentations and active participation in discussion. Students activity during the seminars is evaluated in a scale from 0 to 10 points. 3. Obtaining positive grades from all tests scheduled in a course (3 tests in a semester) conducted either in written or oral form and encompassing designated material covered during lectures, seminars and laboratories as well as based on student's own work from the specified literature. Only the answers from those indicated sources will be considered as the correct ones. To get a credit for a test a Student needs to obtain at least 60% of possible to obtain points, with the reservation, that the criteria for obtaining a credit for a particular test can change (exclusively in favor of Students) after the analysis of the degree of difficulty of a given test. The tests are composed of test questions part (MCQ, MRQ tests) and open questions part that requires completing a task, for example, writing/completing the reaction, diagram, table, graph, description of a mechanism of action, giving examples or traits, calculating the values, etc. Additionally these partial tests will contain 1-2 additional questions from the detailed knowledge, points obtained from these questions will be added to the points of the test, enabling a Student to get >100% of points, with the reservation that the maximal number of points possible to obtain cannot exceed 10% of the maximal number of test points. In a case when a Student will obtain 60% of the test points the Student will not obtain a credit for a given section and is required to retake the test at the indicated date. Retake of the test can be in the written or oral form depending on the number of Students. The final grade from a given test is an average of points obtained in all the terms. The tests are conducted in the direct contact with teacher. In exceptional situations, by the decision of the University Authorities, they can be conducted in a remote form. 4. Each absence on laboratory as well as seminar classes must be made up by a Student in a manner indicated by a person supervising the classes in agreement with a person responsible for the subject. 5. Semestral grade for the subject is based on the sum of points obtained by a Student from the tests conducted in a given semester and points obtained from seminar classes (if they are scheduled in a given semester) expressed as a percentage of maximal number of points possible to obtain in a given semester and calculated according to the criteria for obtaining particular grades presented in a Table below. To promote among the Students a systematic studying, the points obtained during final exam in the subject will be augmented by additional points, calculated on the basis of semestral grades and reflecting a systematic work of a Student during the whole course of Biochemistry with elements of chemistry, according to the following criteria: • Semestral grade: very good (5.0) – 5% of the points possible to obtain during final exam; • Semestral grade: above good (4.5) – 4.5% of the points possible to obtain during final exam; • Semestral grade: good (4.0) – 4% of the points possible to obtain during final exam; Percent points obtained for each semester are summed up, enabling a Student to get additional points amounting to up to 15% of maximal number of final exam points. The Students who from all tests obtained  $\geq 100\%$  of maximal to obtain points (counting also additional points) are exempted from final exam with a grade of 5.0. Both additional points as well as exemption from the final exam are granted exclusively to Students who passed all the tests on the first term.

<b>Grade</b>	<b>Criteria for courses ending with a grade</b>
Very Good (5.0)	$\geq 93\%$ of maximal number of points obtained from the tests
Good Above (4.5)	$\geq 85\%$ of maximal number of points obtained from the tests
Good (4.0)	$\geq 77\%$ of maximal number of points obtained from the tests
Satisfactory Plus (3.5)	$\geq 69\%$ of maximal number of points obtained from the tests
Satisfactory (3.0)	$\geq 60\%$ of maximal number of points obtained from the tests
<b>Criteria for courses ending with a credit (without a grade)</b>	
Credit	
<b>Grade</b>	<b>Criteria for exam</b>
Very Good (5.0)	
Good Above (4.5)	
Good (4.0)	
Satisfactory Plus (3.5)	



Satisfactory (3.0)	
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<b>Department in charge of the course:</b>	Katedra Biochemii i Immunochemii
Head of Department in charge of the course:	prof. dr hab. Małgorzata Krzystek-Korpacka
Telephone:	71 784 13 70, 784 13 71
E-mail:	WL-41.2@umw.edu.pl
<b>Person in charge for the course:</b>	Małgorzata Matusiewicz
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<b>Coordinator of the course:</b>	dr hab. Małgorzata Matusiewicz
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CONSULTATION: Detailed information pertaining to the dates and places for consultation of academic staff are provided on the university websites of the departments in which the given subjects are being conducted. Additionally the information is posted next to the department secretary.

<b>Date of syllabus preparation</b>
2023-10-06