

Course description

Part 1

General information about the course		
1. Major of study: medicine		2. Study level: unified MSc
		3. Form of study: intramural
4. Year: III	5. Semester: V	
6. Course name: Biochemistry with elements of chemistry V		
7. Course status: required		
8. Course contents and assigned learning outcomes		
1. Student uses modern analytical techniques that can be used to evaluate the patient's condition. 2. Student knows basic biochemical processes in the body and knows how to correlate them with the state of the patient. 3. Student interprets the function and regulation of the metabolism of carbohydrates, proteins, lipids, and nucleic acids in physiological conditions as well as the changes that occur in disease. 4. Student knows the most common metabolic diseases and disorders. 5. Student has the ability to identify potential targets of therapy and therapeutic activities.		
Learning outcomes / reference to learning outcomes indicated in the standards		
For knowledge – student knows and understands:		
B.W10.;B.W11.;B.W12.;B.W13.;B.W14.;B.W15.;B.W16.;B.W17.;C.W.34.;C.W.47.;C.W48.;C.W49.;C.W51.;		
For skills student can do: B.U3.;B.U6.;B.U8.;B.U9.;		
For social competencies student is ready to:		
formulate conclusions based on own measurements or observations		
implement the principles of professional behavior and cooperation in a multicultural team		
communicate and cooperate with colleagues during experiments		
9. Number of hours for the course		120
10. Number of ECTS points for the course		10
11. Methods of verification and evaluation of learning outcomes		
Learning outcomes	Methods of verification	Methods of evaluation*
Knowledge	Grade credit – MCQ	*
Skills	Report Observation	*
Competencies	Observation	*

* The following evaluation system has been assumed:

Very good (5.0) – the assumed learning outcomes have been achieved and significantly exceed the required level

Better than good (4.5) – the assumed learning outcomes have been achieved and slightly exceed the required level

Good (4.0) – the assumed learning outcomes have been achieved at the required level

Better than satisfactory (3.5) – the assumed learning outcomes have been achieved at the average required level

Satisfactory (3.0) – the assumed learning outcomes have been achieved at the minimum required level

Unsatisfactory (2.0) – the assumed learning outcomes have not been achieved

Course description

Part 2

Other useful information about the course		
12. Name of Department, mailing address, e-mail:		Department of Biochemistry 18 Medyków St., 40-752 Katowice, PL / +48 (32) 2088 458 / biochem.sum.edu.pl biochemk@sum.edu.pl
13. Name of the course coordinator:		Tomasz Francuz, MD, PhD
14. Prerequisites for knowledge, skills and other competencies:		Biochemistry with elements of chemistry I - IV
15. Number of students in groups	In accordance with the Senate Resolution	
16. Study materials	Required and supplemental reading	
17. Location of classes	Lecture halls, classrooms, and laboratories of the Faculty of Medical Sciences in Katowice	
18. Location and time for contact hours	Department of Biochemistry, daily working hours	
19. Learning outcomes		
Number of the course learning outcome	Course learning outcomes	Reference to learning outcomes indicated in the standards
P_W01 / C_K01	Student knows the structure of organic compounds included in macromolecules present in cells, extracellular matrix, and body fluids	B.W10
P_W02 / C_K02	Student knows the structure of lipids and polysaccharides and their functions in cellular and extracellular structures	B.W11
P_W03 / C_K03	Student knows I-, II-, III- and IV- structures of proteins as well as post-translational and functional modifications of proteins and their significance	B.W12
P_W04 / C_K04	Student knows nucleotide functions; primary and secondary structures of DNA and RNA, and chromatin structure	B.W13
P_W05 / C_K05	Student knows the functions of the genome, transcriptome, and human proteome as well as basic methods used in their study. Processes of DNA replication, repair, recombination, transcription and translation, degradation of DNA, RNA, and proteins, as well as concepts of regulation of gene expression	B.W14
P_W06 / C_K06	Student knows the main catabolic and anabolic pathways, how they are regulated, and the impact of genetic and environmental factors on them	B.W15
P_W07 / C_K07	Student knows the metabolic profiles of the main organs and systems	B.W16

P_W08 / C_K08	Student knows methods of communication between cells and between the cell and the extracellular matrix and signaling pathways in the cell, as well as examples of disorders in these processes leading to the development of cancer and other diseases	B.W17
P_W09 / C_K09	Student knows the most common metabolic diseases and disorders of water-electrolyte, hormonal and acid-base metabolism	C.W34
P_W010 / C_K010	Student knows the influence of oxidative stress on cells and their role in the pathogenesis of diseases and in aging processes	C.W47
P_W011 / C_K011	Student knows the consequences of vitamin or mineral deficiency and excess in the body	C.W48
P_W012 / C_K012	Student knows the enzymes involved in digestion, mechanism of gastric acid production, the role of bile, mechanisms of absorption from the digestive tract	C.W49
P_W013 / C_K013	Student knows the mechanism of action of hormones	C.W50
P_U01 / C_S01	Student can calculate molar and percentage concentrations of substance and concentrations in isosmotic, single and multi-component solutions	B.U3
P_U02 / C_S02	Student can predict the direction of biochemical processes depending on the energy state of cells	B.U6
P_U03 / C_S03	Student can use basic laboratory techniques such as qualitative analysis, titration, colorimetry, pH measurement, chromatography, electrophoresis of proteins and nucleic acids	B.U8
P_U04 / C_S04	Student can operate simple measuring instruments and evaluate the accuracy of measurements	B.U9
20. Forms and topics of classes		Number of hours
21.1. Lectures		60
Introduction to biochemistry. Structure and function of bioorganic compounds		4
Nucleic acids - structure, functions, the human genome, the regulation mechanisms of gene expression, genetic disorders, molecular diagnostic		4
Proteins - structure and function, extracellular matrix proteins, plasma proteins, clinical aspect of abnormalities in protein structure		4
Enzymes - structure, functions, importance, the mechanisms regulating the activity, the biomedical importance, examples of drugs as enzyme inhibitors		4
Vitamins and trace elements - functions in the body, metabolism, sources, symptoms of deficiency and excess in the body, antivitamins		4
Alcohols and psychoactive substances – metabolism, symptoms of use, methods of determination		2
Reactive oxygen species – sources, biomedical importance, pro- and antioxidants		2
Classical hormones - biosynthesis, secretion, receptor mechanisms of signal transduction, metabolism, clinical aspect of overproduction or deficiency		4
Cytokines - the division and functions in the body, pro-inflammatory cytokines, inhibition and stimulation of		4

cytokines pathways	
Carbohydrates I - control of glucose homeostasis, mechanisms of carbohydrate absorption, structure, functions, the digestion of carbohydrates, hormones involved in the regulation of carbohydrate metabolism	2
Carbohydrates II - intracellular metabolism - features metabolites, glycolysis, gluconeogenesis, glycogenolysis, and glycogenesis. Complex carbohydrates – functions, diseases related to carbohydrate metabolism	4
Krebs cycle - role in the metabolism, regulation. Cellular respiration - the production of energy in the cell, the organization of the respiratory chain. The implications of its dysfunction	2
Lipids I - the division of lipids, the importance of lipid absorption and digestion. Plasma lipids, fractions, importance, methods of determination	4
Lipids II - vascular lipid metabolism and intracellular metabolic regulation-cholesterol and isoprenoid, isoprenoids importance. Other important lipids in human metabolism. Division and diagnostic of dyslipidemia	4
Porphyrin - biosynthesis, functions, consequences biosynthesis disorders. Heme catabolism - the final products, the meaning and excretion of heme catabolism, consequences of disorders	2
Purine and pyrimidine - biosynthesis and catabolism features, the consequences of disorders	2
Amino acids - metabolism, meaning, metabolic connections, metabolic consequences of disorders. Nitrogen metabolism of amino acids - cell metabolism, detoxification mechanisms	4
Integration of metabolism	4
22.2. Seminars	
Structure and function of bioorganic compounds	2
Nucleic acids	2
Proteins	2
Enzymes	2
Vitamins and trace elements	2
Alcohols and psychoactive substances	1
Reactive oxygen species	1
Classical hormones	2
Cytokines	2
Carbohydrates	4
Krebs cycles and the respiratory chain	2
Lipids and isoprenoids	2
Purine, pyrimidine, and porphyrin	2
Amino acids	2
Integration of metabolism	2
23.3. Labs	30
Introduction to laboratory techniques	3
Nucleic acids and molecular biology techniques	3
Serum protein	3

Clinically important enzymes	3
Hormones	3
Carbohydrates	3
Lipids	3
Markers of nitrogen metabolism and kidney function	3
Hemoglobin and bile pigments	3
Iron metabolism and immunoenzymatic techniques	3
24. Readings	
Required: Denise R. Ferrier "Biochemistry (Lippincott Illustrated Reviews Series)" 6th edition 2013 (or later) Robert Murray, Daryl Granner, Victor Rodwell "Harpers Illustrated Biochemistry" 29th edition 2012 (or later)	
Supplemental: John Baynes, Marek H. Dominiczak "Medical Biochemistry" 4th edition 2014 (or later) Public internet resources, including PubMed, medical journals available online	
25. Detail evaluation criteria	
In accordance with the recommendations of the inspection bodies Completion of the course – student has achieved the assumed learning outcomes Detail criteria for completion and evaluation of the course are specified in the course regulations	