[Medicinski fakultet u Rijeci]

Curriculum
2023/2024

[Za kolegij]

Biochemistry II

Study program:	**Medical Studies in English (R)** [Sveučilišni integrirani prijediplomski i diplomski studij]
Department:	**[Katedra za medicinsku kemiju, biokemiju i kliničku kemiju]**
Course coordinator:	**prof. dr. sc. Detel Dijana, dr. med.**
Year of study:	**2**
ECTS:	**9**
Incentive ECTS:	**0 (0.00%)**
Foreign language:	**Possibility of teaching in a foreign language**

Course information:

Biochemistry II is a compulsory course at the second year of the Integrated Undergraduate and Graduate University Study of Medicine in English. It consists of 42 hours of lectures, 34 hours of seminars, and 34 hours of laboratory practicals, overall 110 hours (9 ECTS). Lectures and seminars are held in lecture halls of the Faculty of Medicine according to the course schedule. Laboratory practicals are held at the Department of Medical Chemistry, Biochemistry and Clinical Chemistry.

The goal of teaching Biochemistry is to understand how the human body works at the molecular level: how it uses energy, how it keeps its structure, how does it recognize different signals and respond to them, how it develops and grows, and how it protects against disease. The focus is on the integrative function of tissues and organs. This curriculum forms biochemical basis of physiology and offers the student the knowledge necessary for understanding biochemical basis of many pathobiochemical processes and diseases. Understanding these principles should help students and physicians in using the appropriate biochemical diagnostic procedure in order to improve health, in disease prevention, and in treatment of disorders at any human age.

Thorough the seminary part, students will gradually acquire and connect topics related to course aims. Students will acquire knowledge and experience in basic laboratory techniques and analytical clinical methods related to physiological and pathological states of the organism thorough laboratory practicals.

Content of the course

01. Introduction
02. Enzymes
03. Bioenergetics
04. Metabolism of carbohydrates
05. Metabolism of lipids
06. Structure and function of DNA and RNA
07. Hormon action and signal transduction
08. Biological membranes and cellular signaling
09. Metabolism of proteins and amino acids
10. Vitamins 11. Oxidative stress
12. Integration of Metabolism
13. Biomedical importance of serum enzymes and proteins

List of assigned reading:

1. VW. Rodwell et all.: Harpers Illustrated Biochemistry, 30th edition, The McGraw –Hill Education, New York 2015.
2. Č. Milin et. all.: Handbook for seminars and Laboratory practicals in Biochemistry II, Department of Chemistry and Biochemistry Faculty of Medicine, University of Rijeka, 2019.

List of optional reading:

1. JM. Berg et all: Biochemistry, 8 th edition, W.H. Freeman and Company, New York, 2012.
2. DL. Nelson, MM. Cox: Lehninger Principles of Biochemistry, Fourth Edition

Curriculum:

[Predavanja] list (with titles and explanation):

L1 Importance of biochemistry in understanding health and disease and the application of biochemistry in clinical practice.

Understanding the aim of the course. Recognizing the role of Biochemistry in health care.

L2-3 Enzymes. Classification of enzymes. The kinetics of enzyme catalysis. Regulation of enzymatic activity.

To explain the structure and the function of enzymes. To explain the structure and the function of catalytic centers. To describe the kinetics and the mechanism of enzyme-catalyzed reactions. To define and describe mechanisms of enzymatic activity regulation.

L4 Digestion and absorption of carbohydrates.

To list carbohydrates that appear in the food and carbohydrates that are final products of digestion (hydrolysis catalyzed by an enzyme) being transported into enterocytes. To describe enzymes that catalyze hydrolytic cleavage of oligosaccharides and polysaccharides.

L5 Metabolic pathways of carbohydrates. Glycolysis.

To explain anaerobic and aerobic glycolysis pathways and state their final products. To show glycolysis schematically, list glycolysis enzymes, calculate the balance of ATP formation on the substrate level by "aerobic" glycolysis of glucose and glycogen, to describe NAD+ and NADH + H+ roles in the glycolysis, glyceraldehyde-3-P oxidation, and pyruvate reduction. To describe the cellular location of anaerobic glycolysis.

L6 Aerobic and anaerobic glycolysis. Regulation of glycolysis.

To describe and discuss the regulation of glycolysis. To list the regulatory enzymes and reactions.

L7 Oxidative decarboxylation of keto acids.

To show sum equation of oxidative phosphorylation of pyruvate into acetyl-CoA; list all the enzymes, coenzymes, and cofactors involved in the formation of acetyl-CoA from pyruvate and insert them in the metabolic scheme; to state the number of ATP moles generated by formation of acetyl-CoA from one mole pyruvate; to explain the (non)possibility of pyruvate formation from acetyl-CoA.

L8-9 Citric Acid Cycle. Regulation of Citric Acid Cycle.

To state the basic role of citric acid cycle (Tricarboxylic Acid Cycle); to show the cycle schematically, to state cycle reactions' cellular locations; to state reactions by which terminal oxidations occur together with corresponding enzymes and coenzymes; to state citric acid. To list regulatory enzymes and reactions catalysed by those enzymes.

L10 Gluconeogenesis. Cory cycle.

To describe gluconeogenesis, to define molecules that enter the gluconeogenesis pathway, to display glucose and glycogen formation from proteins and lipids, to list phosphatase involved in gluconeogenesis but not in glycolysis; to state reversible glycolysis reactions, to state allosteric enzymes involved in gluconeogenesis regulation

L11-12 Metabolism of Glycogen. Regulation of Glycogen Metabolism.

To describe glycogen formation from glucose through glucose-l-P, and to explain the role of UTP and UDP in that reaction; to schematically show glycogen breakdown in glucose-1-P and its hormonal regulation (hormones, receptors, enzymes, second messengers), to explain the chemical background of glycogen breakdown disorders.

L13 The penthose phosphate pathway.

Schematically show direct oxidation of glucose-6-P into CO_2 and H_2O in the pentose phosphate pathway; to state the most important compounds of oxidative and non-oxidative phase; coenzymes that appear in the oxidative phase dehydrogenases, to explain the role of pentose phosphate pathway – formation of NADPH+ H+ and ribose and their role in metabolism; intermediate compounds that appear both in glycolysis and gluconeogenesis forming the link between those metabolic pathways. To explain the biochemical mechanism and clinical correlation of glucose-6-phosphate dehydrogenase deficiency.

L14-15 Bioenergetics. Oxidative Phosphorylation.

To describe oxidative phosphorylation and electron transport chain, the location of electron transport chain and its topology. To explain the coupling of oxidation of reduced coenzymes with the synthesis of ATP. To explain the ATP synthase mechanism and the regulation of the oxidative phosphorylation.

L16 Digestion and absorption of lipids.

To list the part of the digestive tract where lipolytic breakdown of triacylglycerols (lipids and oils) takes place and the factors that stimulate this breakdown; to describe the intraluminal process of triacylglycerol breakdown concerning pancreatic lipase specificity and the action of bile salts; to describe the triacylglycerol metabolism inside enterocytes.

L17 Mobilisation of fatty acids.

To explain how triacylglycerols (lipids) from adipose tissue serve as organism energy reservoir. To describe the processes by which fatty acids are transported through the blood. To explain processes of fatty acid activation and transport into the matrix of the mitochondria.

L18 Midterm Exam. Enzymes. Carbohydrates. Oxidative decarboxylation.

Midterm Exam. Carbohydrates.

L19 Oxidation of fatty acids.

To describe the catabolism of fatty acids and their cellular location. To calculate the energy balance of fatty acid breakdown. List the essential fatty acids and their characteristics.

L20 Biosynthesis of fatty acids.

To describe the reaction catalyzed by acetyl-CoA carboxylase and understand the mechanisms by which its activity is regulated to control the rate of fatty acid synthesis. To explain reactions of fatty acid biosynthesis and the role of the multienzyme complex in that process.

L21-22 Biosynthesis of triacylglycerols and phospholipids. Glycolipids.

To outline the general structure of triacylglycerols, phospholipids, and glycerosphingolipids and indicate their functions. To explain glycerol origin for the glycerolipid biosynthesis. To explain the role of phospholipases in the degradation and remodeling of phospholipids. To display the phosphatidylcholine, phosphatidylethanolamine, phosphatidylserine, phosphatidylinositol and cardiolipin metabolism; to display sphingomyelin and glycosphingolipid metabolism; to explain the chemical background of sphingolipid metabolism disorders; to describe and to explain the eicosanoid structure, biological role, and metabolism.

L23-24 Biosynthesis and metabolism of cholesterol. Biosynthesis and metabolism of bile acids.

To explain the importance of cholesterol as an essential structural component of cell membranes, as a precursor of steroid hormones, bile acids, and vitamin D. To identify stages of cholesterol biosynthesis from acetyl-CoA. Understand the role of 3-hydroxy-3-methylglutaryl CoA reductase in controlling the rate of cholesterol synthesis and explain the mechanisms by which its activity is regulated. To display cholic, glycocholic, and taurocholic acid biogenesis (bile acids); to state physical and chemical characteristics and biosynthesis of C17, C19, and C21 steroid hormones

L25 Classification and role of lipoproteins in the metabolism.

To count transport pathways of lipids and their metabolites from enterocytes to other parts of organism; to define lipoproteins, to count basic types of lipoproteins and state their chemical content, to state their role in exogenous and endogenous lipid transport; to explain the chemical background of lipoprotein metabolism disorders. Indicate major types of apolipoprotein found in different lipoprotein classes.

L26 Metabolism of xenobiotics.

To define xenobiotics and to explain the biomedical significance of xenobiotic metabolism. To explain the role of liver cells in the detoxification of xenobiotics. To state and explain the reactions of phase I and II. To explain the role of cytochrome P450 and reactions catalyzed by various enzymes.

L27 Nucleic acid structure and function.

To describe the structure and function of nucleic acids; to explain semiconservative replication of DNA, transcription, and protein biosynthesis (translation). Understand the flow of genetic information from DNA to RNA to proteins.

L28 Replication. RNA synthesis. Regulation of gene expression.

to explain semiconservative replication of DNA, transcription, and protein biosynthesis (translation). Understand the flow of genetic information from DNA to RNA to proteins.

L29-30 Protein synthesis. Posttranslational modifications of proteins.

To explain the aim and effects of posttranslational modifications of protein on structure, biochemical activity, and intracellular traffic and sorting of proteins (trans-membrane proteins, peripheral membrane proteins, glycosylphosphatidylinositol anchored proteins); to state the examples; to explain membrane lipids and proteins mobility. To describe the role of ubiquitin in protein degradation.

L31 Midterm exam. Lipids.

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L32 Protein metabolism. Digestion and absorption of proteins.

To understand the proteolysis in the digestive tract and the absorption of amino acids in the intestine; to know extracellular proteases and their classification (exopeptidase, endopeptidase, aminopeptidase, carboxypeptidases, dipeptidylpeptidases), to know the location of action of proteolytic enzymes, the activation and mechanisms of pepsin, trypsin, and chymotrypsin action.

L33-34 Metabolism of amino acids. Decarboxylation, transamination and oxidative deamination.

To name and know the basic pathways of amino acid degradation (decarboxylation, transamination, oxidative deamination); to explain the reaction of amino acid decarboxylation, name enzymes and coenzymes; to list biologically important amines. To explain the processes of oxidative deamination of amino acids, formation of keto acids and ammonia, specify oxidoreductases that catalyze reactions and coenzymes; to explain the formation of ammonia in the combined processes of transamination and oxidative deamination resulting in glutamate; to explain the mechanism of transaminase action.

L35 Urea cycle

To indicate from which compounds high-energy carbamoyl phosphate is formed, schematically show intermediates of urea cycle and urea formation; to identify the subcellular locations of the enzymes that catalyses the cycle; to explain the utilization of ATP.

L36 Signal molecules. Role in the regulation of metabolism

To explain the principles of cellular signaling. To list the signal molecules according to solubility.

L37-38 Receptors and signal transduction. Hormonal regulation of metabolism.

To explain the role of receptors in signal transduction. To describe the classification of hormones. To explain the mechanisms of hormone action and the hierarchy of hormones. To explain the role of receptors and G proteins as well as the generation of second messengers in hormone signal transduction. To explain the hormonal regulation of cellular processes through activation of cAMP and phospholipase C. To understand the mechanism of steroid hormone action; to explain the mechanism of eicosanoids action. To list MAP kinases pathway; to explain the role of the transcription factor NF-κB.

L39-40 Regulation of metabolic pathways.

Integrate the metabolic destiny of a food ingredient from its digestion and absorption to complete degradation or conversion into an intermediate product. To describe the peculiarities of metabolic processes present in skeletal muscle, fatty tissue, liver, and brain.

L41-42 Biomedical importance of plasma enzymes.

To understand the biological and diagnostic importance of serum proteins and enzymes; alanine and aspartate aminotransferase (ALT and AST), glutamate dehydrogenase (GLDH), gama-glutamiltransferase (gamaGT), cholinesterase (CHE), creatine kinase (CK), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), lipase, and amylase. To know the application and the role of enzymes in the diagnosis and clinical practice.

[Vježbe] list (with titles and explanation):

LP1 Methods in biochemistry

To explain the principle of the methods used in biochemical laboratories (chromatography, mass spectrometry,

immunochemical methods (ELISA), western blot, DNA analysis). Apply High Performance Liquid Chromatography (HPLC) to separate the analyte in the mixture.

LP2 Factors affecting enzymatic activity

To explain the influence of pH and temperature on the ALP enzymatic activity. To explain how substrate concentration and inhibitor affect the rate of enzyme-catalyzed reaction.

LP3 Qualitative and quantitative analysis of carbohydrates

To apply a qualitative reaction to detect carbohydrates in biological samples. To measure serum glucose concentration, interpret, and explain the results.

LP4 Electrophoresis of lipoproteins

To apply spectrophotometry and electrophoresis in order to determine serum lipid profile. Apply qualitative methods for the detection of pathological components of urine.

LP5 Determination of iron concentration in serum

To determine parameters of iron status. To apply qualitative methods for the detection of pathological components of urine.

LP6 Determination of non-protein nitrogen compounds

To measure urine and serum renal function parameters, interpret the results, and explain possible causes of hyperuricemia and urinary infections. Apply qualitative methods for the detection of pathological components in the urine.

LP7 Determination of clinically important enzymes

To determine serum activities of ALT, AST, ALP, CHA, and □-GT and to relate their activity with specific physiological and pathological processes.

LP8 Clinical laboratory

Biological material and processing in clinical bichemistry Biochemical results and and their interpretation

LP9 Midterm exam. Correction of the midterm exams.

Midterm Eaxm; Metabolism of proteins, signal molecules, Enzymes. Short written tests.

[Seminari] list (with titles and explanation):

S1 Enzymes

To explain the kinetics and the mechanism of enzyme-catalysed reactions. To describe and to explain the regulation of enzymatic activity

S2 Cofactors. Water soluble vitamins.

To classify and to describe the structure of cofactors. To explain the modalities of coenzyme action. To explain the role of water-soluble vitamins in enzymatic activity.

S3 Fat soluble vitamins.

To explain the biological role of vitamins in human health. To explain the structure, principal functions, and metabolism of fat-soluble vitamins A, D, E, K. To explain the role of vitamin A in the metabolism of rhodopsin (rhodopsin biosynthesis), gene expression, and tissue differentiation. To describe the metabolism of vitamin D in the skin, liver, and kidney. To explain the role of vitamin D in the control of calcium homeostasis. To explain vitamin E antioxidative properties in cell membranes and plasma proteins. To describe the role of vitamin K in blood clotting

S4 Biochemically important reactions.

To indicate, explain the physiological role and mechanism of biochemically important reactions.

S5 Carbohydrate metabolism. Regulation of gluconeogenesis.

To describe the conversion of galactose, mannose, and fructose into glucose (monosaccharide interconversion); to

state enzymes (and coenzymes) involved in the enzyme catalyzed epimerization of galactose into glucose; to explain the chemical background of galactose metabolism disorders; to show and to explain fructose metabolism, to explain the chemical background of fructose metabolism disorders.

S6 Function and structure of respiratory chain complexes.

To illustrate the structure of the respiratory chain. List respiratory chain complexes involved in the transfer of electrons. To explain the mechanism of electron transfer and chemiosmotic hypothesis. Understand the role of ubiquinone cycle and synthesis of ATP. To classify enzymes and cofactors according to the type of catalysed reaction. To explain the role of specific cofactor in biocatalysis.

S7 Free radicals, oxidative stress, and antioxidants' structure and nature.

To explain the mechanisms of formation and the role of free radicals as well as the mechanisms of free radicals' elimination

S8 Metabolism of lipids.

To name and understand the structure and chemistry of physiologically important lipids. To define the meaning of the term lipids, and to explain their distribution according to their role and structure; to know the most important representatives of elementary and complex lipids, biological important steroids, biological important terpenes. To identify essential fatty acids and to explain their characteristics. To explain the biosynthesis of polyunsaturated fatty acids. To identify ketone bodies, to describe the reaction by which they are formed and used as a fuel for extrahepatic tissues. Identify pathological conditions when ketosis and ketoacidosis occur. To explain biochemical mechanism and biochemical aspects of clinical disorders of lipoprotein metabolism

S9 Metabolism of iron, porphyrins and bile pigments.

To describe the mechanism of iron absorption, distribution, and storage into tissues. To describe the physiological and clinical role of transferrin, ferritin, iron concentration in serum, and hepcidin in the human organism. To explain the causes and clinical picture of iron deficiency. To explain the pathway of porphyrin biosynthesis. To describe the causes and clinical picture of various porphyrias.

S10 Metabolic functions of the liver.

To know and explain synthetic, metabolic, and excretory function of the liver. To explain the mechanisms of heme degradation. To explain metabolic degradation pathway of bilirubin, name and explain related metabolic disorders. To know the synthesis of bile acids.

S11 Catabolism of carbon skeletons of amino acids. Metabolic transformation of individual amino acids.

To describe metabolic pathways for glycine, serine, aspartic and glutamic acid, arginine, histidine, phenylalanine, tyrosine, tryptophan, cysteine catabolism; metabolic scheme of aromatic amino acid degradation. To explain the mechanism of phenylketonuria, alcaptonuria, albinism, and disease of metabolism of branched-chain amino acids.

S12 Plasma proteins and their physiological, biochemical, and diagnostic functions. Biomedical importance of plasma proteins.

To indicate the composition and the role of blood. To classify plasma proteins. To list and explain the separation methods of plasma proteins. To indicate the causes of changes in the concentration of plasma proteins. To specify and distinguish acute phase proteins. To know the application and the role of haptoglobin, ceruloplasmin, α2-macroglobulin, transferrin, α1-fetoprotein, α1-antitrypsin, fibrinogen, and α1- acid glycoprotein in the disease diagnosis and clinical practice. To clarify the diagnostic value of serum proteins in the case of α1–antitrypsin deficiency.

Oral colloqium and Consultation(s)

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Student obligations:

Class attendance, including test attendance, is mandatory. Students may be absent from 30% of each form of teaching provided they have a justifiable cause. If a student is absent for more than 30% of the classes, he/she will have to re-enroll the course. Absence from seminars is compensated by an oral colloquium. Students are expected to actively participate in all aspects of the course, complete laboratory reports on time, and attend the examinations. Moreover, preparation of the course content, which is going to be discussed during seminars and laboratory practicals, is obligatory. During laboratory practicals, a student is obligated to wear a lab coat, to have tools (a wiping pad, a ruler, and a calculator), and the Handbook for seminars and practicals in Biochemistry II.

Exam (exam taking, description of the written/oral/practical part of the exam, point distribution, grading criteria):

Student grading will be conducted according to the current Ordinance on Studies of the University of Rijeka (approved by the Senate) and the Ordinance on Student Grading at the Faculty of Medicine in Rijeka (approved by the Faculty Council).

Assessment of the student work

Student work will be assessed and graded during the course and on the final exam. During the course, students may obtain a total of 100 grade points (credits). Students can achieve up to 70% of the final grade during the classes, and a maximum of 30% of the final grade at the final exam.

Evaluation of students' progress during classes, midterms, and the final exam in academic year 2022/2023 is shown in Table 1.

Table 1. Distribution of grade points in the course "Biochemistry II"

	Evaulation	**Grade points**
Midterm exams	Midterm exam I	20
	Midterm exam II	20
	Midterm exam III	20
	Total	**60**
Laboratory practicals	Completed practical and accepted written report	8
Seminars	Active participation	2
TOTAL		**70**
Final exam	Written exam (30 questions)	15
	Oral exam	15
	Total	**30**
TOTAL		**100**

Written midterm exams

During the semester, three written midterm exams are planned, which will include the content of lectures, seminars, and laboratory practicals. At each midterm exam, the maximum of grade points that a student can obtain is 18.

All written midterm exams consist of 40 multiple choice questions and are evaluated according to the criteria shown in Table 2. In order to obtain grade points, a student should have/gain a minimum 50% of correct answers on each midterm exam. Settled midterm exams are valid for the current academic year in which they are placed.

Table 2. Evaluation of written midterm exams I-III

% of correct answered questions	Grade points/credits
50.00 – 54.99	10
55.00 – 59.99	11
60.00 – 64.99	12
65.00 – 69.99	13
70.00 – 74.99	14
75.00 – 79.99	15
80.00 – 84.99	16
85.00 – 89.99	17
90.00 – 94.99	18
95.00 – 97.99	19
98.00 – 100,00	20

Correction of the midterm exams

A student can access the correction of the midterm exams if he/she i) did not obtain a minimum criteria (50% on each midterm) or ii) is not satisfied with the obtained credits and iii) in case of absence at the midterm exam due to a justified reason. If a student retakes the midterm exam because he/she is not satisfied with the obtained grade points, only the credits gained from the retaken midterms will be considered. Evaluation of the midterm corrections will be performed according to the criteria shown in the Table 2. Students will have the opportunity to correct one or more midterm exam only once. Correction of the midterm exam I-III will be held after completing regular class in terms set by the course schedule.

Laboratory practicals

A student can gain 8 credits throughout laboratory practicals. Evaulation of laboratory practicals implais precisely completed experimental part of laboratory practical (maximum of 4 grade points) and completed and accepted written report (maximum of 4 grade points). During laboratory practicals, the oral examination of the student can be performed by the teacher.

Seminars

Throughout the course, 12 seminars are planned during which students can achieve 2 grade points through active participation.

Final exam

The final exam is mandatory and comprises written and oral assessment. During the final exam, students can gain a maximum of 30 credits, 15 credits in the written part and 15 credits during the oral assessment. Students are required to meet the minimum criteria for both parts of the final exam.

The written and the oral part of the final exam cover the entire course content. The written part of the final exam consists of 30 multiple choice questions. In order to meet minimum criteria and earn grade points, students must have 50% of correctly solved questions. Achievements during the written part of the final exam will be converted into grade points according to the criteria shown in Table 3. In case when a student did not achieve the minimum criteria on the written part of the final exam, attending the final exam on the following exam term is mandatory.

Assessment of the oral part of the final exam:

7.5 credits: minimum criteria satisfied

8 - 9 credits: average criteria satisfied with noticeable errors

10 – 12 credits: answer with a few errors

13 – 15 credits: outstanding answer.

In order to pass the final exam, a student must achieve at least 50% of positive answers on both written and oral parts of the final exam. If the student is not satisfied with the final grade, he/she may refuse the grade. In case a student does not accept the grade, he/she must re-enter the final exam.

Table 3. Evaulation of the written part of a final exam

% of correct answered questions	Grade points/credits
50.00 – 59.99	7.5
60.00 – 64.99	8
65.00 – 69.99	9
70.00 – 74.99	10
75.00 – 79.99	11
80.00 – 84.99	12
85.00 – 89.99	13
90.00 – 94.99	14
95.00 – 100.00	15

Conditions for admission to the final exam

A student who accomplishes 35 or more grade points during all course classes can access the final exam. If a student achieves less than 35 grade points during all course classes, correction of the midterm exams will be organized. A student who achieves less than 35 grade points during all course classes even after the correction of the midterm exams, or is absent for more than 30% of all forms of classes, is graded as unsuccessful (F) and must re-enter the course.

Final grade

The final grade represents a sum of all grade points obtained during all course classes and on the final exam. Students are evaluated according to the ECTS (A-F) and numerical (1-5) system.

The ECTS and the numerical grading system are defined by the following criteria: A (5) 90 - 100 credits B (4) 75 - 89.99 credits C (3) 60 - 74.99 credits D (2) 50 - 59.99 credits F (1) 0 - 49.99 credits

Other notes (related to the course) important for students:

Teaching is held at the prescribed time and it is not possible to enter after the teacher enters. Food and beverages are not permitted in the classroom or in the laboratory. This includes plate lunches, drinks, candies, etc., whether opened or not. Likewise, cell phones are not allowed in the classroom during the midterm or final exams. Students must arrive on time for exam attendance. Anyone late for more than 15 minutes may be refused to undertake the exam.

Academic Honesty

It is expected that all students and teachers follow the code of academic honesty in accordance with the Code of ethics for the students of the Faculty of Medicine at the University of Rijeka. Please read the policy regarding academic honesty at: http://medical-studies-in-english.com/wp-content/uploads/2016/12/CODE-OF-ETHICS.pdf

Contact information

For questions and concerns, please feel free to contact us by e-mail or via the Department website. If you want to speak with a teacher during office hours (each working day between 11:00 am and 13:00 am), please let us know by e-mail or in class.

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Iva Suman, PhD, Mag. Env. Pub. Health, Assistant e-mail: iva.suman@uniri.hr

Expected competencies at course enrollment: Students are expected to have basic knowledge of biology and chemistry.

COURSE HOURS 2023/2024

Biochemistry II

[Predavanja] (Place and time or group)	**[Vježbe]** (Place and time or group)	**[Seminari]** (Place and time or group)
03.10.2023		

	LP1 Methods in biochemistry:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 11:00) [520]
	  ○ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (11:00 - 14:00) [348]
	  ○ Biochemistry_LP2
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (11:00 - 14:00) [520]
	  ○ Biochemistry_LP3	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
04.10.2023		
L1 Importance of biochemistry in understanding health and disease and the application of biochemistry in clinical practice.: • [P15 - VIJEĆNICA] (12:00 - 13:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
06.10.2023		
L2-3 Enzymes. Classification of enzymes. The kinetics of enzyme catalysis. Regulation of enzymatic activity.: • [P15 - VIJEĆNICA] (10:00 - 12:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
09.10.2023		
		S1 Enzymes: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (08:00 - 10:00) [516] ○ Biochemistry_S1
prof. dr. sc. Detel Dijana, dr. med. [516]		
10.10.2023		
		S1 Enzymes: • [P05] (11:00 - 13:00) [516] ○ Biochemistry_S2
prof. dr. sc. Detel Dijana, dr. med. [516]		
11.10.2023		

L4 Digestion and absorption of carbohydrates.: • [P01] (12:00 - 13:00) [518] ◦ BI_327		
doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
13.10.2023		

L5 Metabolic pathways of carbohydrates. Glycolysis.:
• [P08] (10:00 - 12:00) [518]
  ◦ BI_327
 	
L6 Aerobic and anaerobic glycolysis. Regulation of glycolysis.:
• [P08] (10:00 - 12:00) [518]
  ◦ BI_327		

doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
16.10.2023		
		S2 Cofactors. Water soluble vitamins.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (08:00 - 10:30) [520] ◦ Biochemistry_S1
dr. sc. Suman Iva, mag. sanit. ing. [520]		
17.10.2023		

	LP2 Factors affecting enzymatic activity:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 11:00) [517]
	  ◦ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (11:00 - 14:00) [517]
	  ◦ Biochemistry_LP3
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (11:00 - 14:00) [348]
	  ◦ Biochemistry_LP2	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517]		
18.10.2023		
L7 Oxidative decarboxylation of keto acids.: • [P15 - VIJEĆNICA] (12:00 - 13:00) [152] ◦ BI_327		
prof. dr. sc. Domitrović Robert, univ. mag. med. biochem. [152]		
19.10.2023		
		S2 Cofactors. Water soluble vitamins.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (13:00 - 15:30) [520] ◦ Biochemistry_S2

dr. sc. Suman Iva, mag. sanit. ing. [520]		
20.10.2023		
L8-9 Citric Acid Cycle. Regulation of Citric Acid Cycle.: • [P01] (10:00 - 12:00) [152] ○ BI_327		
prof. dr. sc. Domitrović Robert, univ. mag. med. biochem. [152]		
23.10.2023		
		S3 Fat soluble vitamins.: • [P06] (08:00 - 10:00) [348] ○ Biochemistry_S1
izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348]		
24.10.2023		
		S3 Fat soluble vitamins.: • [P06] (11:00 - 13:00) [348] ○ Biochemistry_S2
izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348]		
25.10.2023		
L10 Gluconeogenesis. Cory cycle.: • [P15 - VIJEĆNICA] (12:00 - 13:00) [518] ○ BI_327		
doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
27.10.2023		
L11-12 Metabolism of Glycogen. Regulation of Glycogen Metabolism.: • [P01] (10:00 - 12:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
30.10.2023		
		S4 Biochemically important reactions.: • [P05] (08:00 - 10:00) [520] ○ Biochemistry_S1
dr. sc. Suman Iva, mag. sanit. ing. [520]		
31.10.2023		

L13 The penthose phosphate pathway.:
• [P01] (14:00 - 15:00) [516]
  ◦ BI_327
	LP3 Qualitative and quantitative analysis of carbohydrates:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 11:00) [520]
	  ◦ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (11:00 - 14:00) [348]
	  ◦ Biochemistry_LP2
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (11:00 - 14:00) [517]
	  ◦ Biochemistry_LP3	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517] · prof. dr. sc. Detel Dijana, dr. med. [516] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
02.11.2023		
		S4 Biochemically important reactions.: • [P06] (12:00 - 14:00) [520] ◦ Biochemistry_S2
dr. sc. Suman Iva, mag. sanit. ing. [520]		
03.11.2023		
L14-15 Bioenergetics. Oxidative Phosphorylation.: • [P01] (10:00 - 12:00) [152] ◦ BI_327		
prof. dr. sc. Domitrović Robert, univ. mag. med. biochem. [152]		
06.11.2023		
		S5 Carbohydrate metabolism. Regulation of gluconeogenesis.: • [P05] (08:00 - 10:30) [518] ◦ Biochemistry_S1
doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
07.11.2023		
		S5 Carbohydrate metabolism. Regulation of gluconeogenesis.: • [P04] (11:30 - 14:00) [518] ◦ Biochemistry_S2
doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
08.11.2023		

L16 Digestion and absorption of lipids.:
• [P01] (12:00 - 14:00) [518]
  ◦ BI_327
 	
L17 Mobilisation of fatty acids.:
• [P01] (12:00 - 14:00) [518]
  ◦ BI_327		

doc. dr. sc. Marinić Jelena, dipl. ing. [518]		

10.11.2023		
L18 Midterm Exam. Enzymes. Carbohydrates. Oxidative decarboxylation.: • [P02] (10:00 - 11:00) [516] ◦ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
14.11.2023		
		S6 Function and structure of respiratory chain complexes.: • [P04] (11:00 - 13:30) [348] ◦ Biochemistry_S2
izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348]		
15.11.2023		
		S6 Function and structure of respiratory chain complexes.: • [ONLINE] (12:00 - 14:30) [348] ◦ Biochemistry_S1
izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348]		
17.11.2023		

L19 Oxidation of fatty acids.:
• [P01] (10:00 - 12:00) [518]
  ◦ BI_327
 	
L20 Biosynthesis of fatty acids.:
• [P01] (10:00 - 12:00) [518]
  ◦ BI_327		

doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
20.11.2023		

		S7 Free radicals, oxidative stress, and antioxidants' structure and nature.:
		• [P04] (08:00 - 10:00) [517]
		  ◦ Biochemistry_S1
		• [P06] (12:00 - 14:00) [517]
		  ◦ Biochemistry_S2

doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517]		
22.11.2023		
L21-22 Biosynthesis of triacylglycerols and phospholipids. Glycolipids.: • [P01] (12:00 - 14:00) [516] ◦ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
24.11.2023		

L23-24 Biosynthesis and metabolism of cholesterol. Biosynthesis and metabolism of bile acids.: • [P01] (10:00 - 12:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
27.11.2023		

		S8 Metabolism of lipids.:
		• [P09 - NASTAVA NA ENGLESKOM JEZIKU] (08:00 - 10:30) [518]
		  ○ Biochemistry_S1
		• [P09 - NASTAVA NA ENGLESKOM JEZIKU] (13:00 - 15:30) [518]
		  ○ Biochemistry_S2

doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
28.11.2023		

	LP4 Electrophoresis of lipoproteins:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 11:00) [520]
	  ○ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (12:00 - 15:00) [348]
	  ○ Biochemistry_LP2
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (12:00 - 15:00) [517]
	  ○ Biochemistry_LP3	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
29.11.2023		
L25 Classification and role of lipoproteins in the metabolism.: • [P01] (12:00 - 13:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
01.12.2023		

L26 Metabolism of xenobiotics.:
• [P08] (10:00 - 11:00) [152]
  ○ BI_327
 	
L27 Nucleic acid structure and function.:
• [P08] (11:00 - 12:00) [348]
  ○ BI_327		

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · prof. dr. sc. Domitrović Robert, univ. mag. med. biochem. [152]		
04.12.2023		

		S9 Metabolism of iron, porphyrins and bile pigments.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (08:30 - 11:00) [516] ◦ Biochemistry_S1
prof. dr. sc. Detel Dijana, dr. med. [516]		
06.12.2023		
		S9 Metabolism of iron, porphyrins and bile pigments.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (12:15 - 14:45) [516] ◦ Biochemistry_S2
prof. dr. sc. Detel Dijana, dr. med. [516]		
08.12.2023		
L29-30 Protein synthesis. Posttranslational modifications of proteins.: • [P15 - VIJEĆNICA] (10:00 - 12:00) [348] ◦ BI_327		
izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348]		
12.12.2023		

L28 Replication. RNA synthesis. Regulation of gene expression.:
• [P09 - NASTAVA NA ENGLESKOM JEZIKU] (14:30 - 15:30) [348]
  ◦ BI_327
	LP5 Determination of iron concentration in serum:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 10:30) [520]
	  ◦ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (11:00 - 13:30) [348]
	  ◦ Biochemistry_LP2
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (11:00 - 13:30) [517]
	  ◦ Biochemistry_LP3	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
13.12.2023		
L32 Protein metabolism. Digestion and absorption of proteins.: • [P15 - VIJEĆNICA] (12:00 - 13:00) [516] ◦ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
15.12.2023		
L31 Midterm exam. Lipids.: • [P02] (10:00 - 11:00) [516] ◦ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		

18.12.2023		
		S10 Metabolic functions of the liver.: • [P01] (13:30 - 15:30) [520] ○ Biochemistry_S1
dr. sc. Suman Iva, mag. sanit. ing. [520]		
19.12.2023		
		S10 Metabolic functions of the liver.: • [P05] (12:00 - 14:30) [520] ○ Biochemistry_S2
dr. sc. Suman Iva, mag. sanit. ing. [520]		
20.12.2023		
L33-34 Metabolism of amino acids. Decarboxylation, transamination and oxidative deamination.: • [ONLINE] (11:00 - 13:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
21.12.2023		
L35 Urea cycle: • [ONLINE] (12:00 - 13:00) [516] ○ BI_327		
prof. dr. sc. Detel Dijana, dr. med. [516]		
08.01.2024		
		S11 Catabolism of carbon skeletons of amino acids. Metabolic transformation of individual amino acids.: • [P04] (08:00 - 10:30) [518] ○ Biochemistry_S1
doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
09.01.2024		

	LP6 Determination of non-protein nitrogen compounds:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 10:30) [520]
	  ○ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (12:00 - 14:30) [348] [517]
	  ○ Biochemistry_LP3
	  ○ Biochemistry_LP2	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
10.01.2024		

L36 Signal molecules. Role in the regulation of metabolism: • [P08] (12:00 - 13:00) [152] ◦ BI_327		
prof. dr. sc. Domitrović Robert, univ. mag. med. biochem. [152]		
11.01.2024		
		S11 Catabolism of carbon skeletons of amino acids. Metabolic transformation of individual amino acids.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (12:00 - 15:30) [518] ◦ Biochemistry_S2
doc. dr. sc. Marinić Jelena, dipl. ing. [518]		
12.01.2024		
L37-38 Receptors and signal transduction. Hormonal regulation of metabolism.: • [P01] (10:00 - 12:00) [152] ◦ BI_327		
prof. dr. sc. Domitrović Robert, univ. mag. med. biochem. [152]		
15.01.2024		
		S12 Plasma proteins and their physiological, biochemical, and diagnostic functions. Biomedical importance of plasma proteins.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (13:00 - 15:30) [517] ◦ Biochemistry_S2
doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517]		
16.01.2024		

	LP7 Determination of clinically important enzymes:
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (08:00 - 11:00) [520]
	  ◦ BIochemistry_LP1
	• [Katedra za med. kemiju, biokemiju i klin. kemiju 2] (12:00 - 15:00) [348]
	  ◦ Biochemistry_LP2
	• [Katedra za med. kemiju, biokemiju i klin. kemiju] (12:00 - 15:00) [517]
	  ◦ Biochemistry_LP3	

izv. prof. dr. sc. Batičić Lara, dipl. sanit. ing. [348] · doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
17.01.2024		
L41-42 Biomedical importance of plasma enzymes.: • [P01] (11:00 - 13:00) [516] ◦ BI_327		

prof. dr. sc. Detel Dijana, dr. med. [516]		
18.01.2024		
		S12 Plasma proteins and their physiological, biochemical, and diagnostic functions. Biomedical importance of plasma proteins.: • [P07] (13:00 - 15:30) [517] ◦ Biochemistry_S1
doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517]		
19.01.2024		
L39-40 Regulation of metabolic pathways.: • [P15 - VIJEĆNICA] (10:00 - 12:00) [516] ◦ BI_327	LP9 Midterm exam. Correction of the midterm exams.: • [P15 - VIJEĆNICA] (12:00 - 14:00) [516] ◦ BI_327	
prof. dr. sc. Detel Dijana, dr. med. [516]		
22.01.2024		
	LP8 Clinical laboratory: • [KBC Sušak --] (08:00 - 11:00) [218] ◦ BIochemistry_LP1	
asistentica Šupak Smolčić Vesna, mag. med. biochem. [218]		
23.01.2024		
	LP8 Clinical laboratory: • [KBC Sušak --] (08:00 - 11:00) [218] ◦ Biochemistry_LP2	
asistentica Šupak Smolčić Vesna, mag. med. biochem. [218]		
24.01.2024		
	LP8 Clinical laboratory: • [KBC Sušak --] (08:00 - 11:00) [218] ◦ BI_327	
asistentica Šupak Smolčić Vesna, mag. med. biochem. [218]		
26.01.2024		
		Oral colloqium and Consultation(s): • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (10:00 - 12:00) [516] [517] [518] [520] ◦ Biochemistry_S1 ◦ Biochemistry_S2
doc. dr. sc. Buljević Sunčica, dipl. sanit. ing. [517] · prof. dr. sc. Detel Dijana, dr. med. [516] · doc. dr. sc. Marinić Jelena, dipl. ing. [518] · dr. sc. Suman Iva, mag. sanit. ing. [520]		
29.01.2024		

	LP9 Midterm exam. Correction of the midterm exams.: • [P02] (11:00 - 12:00) [516] ○ BI_327	
prof. dr. sc. Detel Dijana, dr. med. [516]		

List of lectures, seminars and practicals:

[PREDAVANJA] (TOPIC)	Number of hours	Location
L1 Importance of biochemistry in understanding health and disease and the application of biochemistry in clinical practice.	1	[P15 - VIJEĆNICA]
L2-3 Enzymes. Classification of enzymes. The kinetics of enzyme catalysis. Regulation of enzymatic activity.	2	[P15 - VIJEĆNICA]
L4 Digestion and absorption of carbohydrates.	1	[P01]
L5 Metabolic pathways of carbohydrates. Glycolysis.	1	[P08]
L6 Aerobic and anaerobic glycolysis. Regulation of glycolysis.	1	[P08]
L7 Oxidative decarboxylation of keto acids.	1	[P15 - VIJEĆNICA]
L8-9 Citric Acid Cycle. Regulation of Citric Acid Cycle.	2	[P01]
L10 Gluconeogenesis. Cory cycle.	1	[P15 - VIJEĆNICA]
L11-12 Metabolism of Glycogen. Regulation of Glycogen Metabolism.	2	[P01]
L13 The penthose phosphate pathway.	1	[P01]
L14-15 Bioenergetics. Oxidative Phosphorylation.	2	[P01]
L16 Digestion and absorption of lipids.	1	[P01]
L17 Mobilisation of fatty acids.	1	[P01]
L18 Midterm Exam. Enzymes. Carbohydrates. Oxidative decarboxylation.	1	[P02]
L19 Oxidation of fatty acids.	1	[P01]
L20 Biosynthesis of fatty acids.	1	[P01]
L21-22 Biosynthesis of triacylglycerols and phospholipids. Glycolipids.	2	[P01]
L23-24 Biosynthesis and metabolism of cholesterol. Biosynthesis and metabolism of bile acids.	2	[P01]
L25 Classification and role of lipoproteins in the metabolism.	1	[P01]
L26 Metabolism of xenobiotics.	1	[P08]
L27 Nucleic acid structure and function.	1	[P08]
L28 Replication. RNA synthesis. Regulation of gene expression.	1	[P09 - NASTAVA NA ENGLESKOM JEZIKU]
L29-30 Protein synthesis. Posttranslational modifications of proteins.	2	[P15 - VIJEĆNICA]
L31 Midterm exam. Lipids.	1	[P02]
L32 Protein metabolism. Digestion and absorption of proteins.	1	[P15 - VIJEĆNICA]
L33-34 Metabolism of amino acids. Decarboxylation, transamination and oxidative deamination.	2	[ONLINE]
L35 Urea cycle	1	[ONLINE]
L36 Signal molecules. Role in the regulation of metabolism	1	[P08]

L37-38 Receptors and signal transduction. Hormonal regulation of metabolism.	2	[P01]
L39-40 Regulation of metabolic pathways.	2	[P15 - VIJEĆNICA]
L41-42 Biomedical importance of plasma enzymes.	2	[P01]

[VJEŽBE] (TOPIC)	Number of hours	Location
LP1 Methods in biochemistry	4	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP2 Factors affecting enzymatic activity	4	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP3 Qualitative and quantitative analysis of carbohydrates	4	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP4 Electrophoresis of lipoproteins	4	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP5 Determination of iron concentration in serum	4	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP6 Determination of non-protein nitrogen compounds	3	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP7 Determination of clinically important enzymes	4	[Katedra za med. kemiju, biokemiju i klin. kemiju 2] [Katedra za med. kemiju, biokemiju i klin. kemiju]
LP8 Clinical laboratory	4	[KBC Sušak --]
LP9 Midterm exam. Correction of the midterm exams.	3	[P02] [P15 - VIJEĆNICA]

[SEMINARI] (TOPIC)	Number of hours	Location
S1 Enzymes	2	[P05] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
S2 Cofactors. Water soluble vitamins.	3	[P09 - NASTAVA NA ENGLESKOM JEZIKU]
S3 Fat soluble vitamins.	2	[P06]
S4 Biochemically important reactions.	2	[P05] [P06]
S5 Carbohydrate metabolism. Regulation of gluconeogenesis.	3	[P04] [P05]
S6 Function and structure of respiratory chain complexes.	3	[ONLINE] [P04]

S7 Free radicals, oxidative stress, and antioxidants’ structure and nature.	2	[P04] [P06]
S8 Metabolism of lipids.	3	[P09 - NASTAVA NA ENGLESKOM JEZIKU]
S9 Metabolism of iron, porphyrins and bile pigments.	3	[P09 - NASTAVA NA ENGLESKOM JEZIKU]
S10 Metabolic functions of the liver.	3	[P01] [P05]
S11 Catabolism of carbon skeletons of amino acids. Metabolic transformation of individual amino acids.	3	[P04] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
S12 Plasma proteins and their physiological, biochemical, and diagnostic functions. Biomedical importance of plasma proteins.	3	[P07] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
Oral colloqium and Consultation(s)	2	[P09 - NASTAVA NA ENGLESKOM JEZIKU]

EXAM DATES (final exam):

1.	06.02.2024.
2.	20.02.2024.
3.	11.07.2024.
4.	03.09.2024.
5.	17.09.2024.