

<i>Name of the course</i>	<b>Medical Chemistry and Biochemistry</b>			<b>Code</b>	
<i>Type of study program Cycle</i>	Integrated university study, medicine			<b>Year of study</b>	II
<i>Credits (ECTS) :</i>	<b>16</b>	<i>Semester</i>	III	Number of hours per semester (1+e+s)	210 (116+54+40)
<i>Status of the course:</i>	Mandatory	<i>Preconditions:</i>	Passed all exams of the 1st year	<i>Comparative conditions:</i>	
<i>Access to course:</i>	Second year students			<i>Hours of instructions:</i>	According to schedule
<i>Course teacher:</i>	Assistant professor Ivanka Mikulić Professor Zora Pilić Assistant professor Ilijana Odak Professor Ivana Čepelak Professor Tihana Žanić Grubišić				
<i>Consultations:</i>	As agreed				
<i>E-mail address and phone number:</i>	<a href="mailto:ivankacolak@yahoo.com">ivankacolak@yahoo.com</a> 063371999				
<i>Associate teachers:</i>	Nevenka Jelić Knezović Vinka Mikulić Kristina Landeka				
<i>Consultations:</i>	As agreed				
<i>E-mail address and phone number:</i>	<a href="mailto:nevenka.jelic@sve-mo.ba">nevenka.jelic@sve-mo.ba</a> ; 063890188 <a href="mailto:barac.vinka@gmail.com">barac.vinka@gmail.com</a> ; 0633501916 <a href="mailto:klandeka@gmail.com">klandeka@gmail.com</a> ; 063611611				
<i>The aims of the course:</i>	<p>The objectives of this course are:</p> <p>To introduce students with basic knowledge of inorganic, organic and physical chemistry necessary for understanding the human body. To apply the basic principles of molecular logic of biochemical processes in a living organism; To understand dynamics of the synthesis and degradation of natural bio-macromolecules: proteins, polysaccharides, lipids and nucleic acids. To analyze important factors that influence the dynamics of cell metabolism and the principles of its regulation and control.</p> <p>Furthermore, to introduce students with the characteristics of certain biochemical markers and their relationship with the function of major organ systems. To understand how the body works at the molecular level, which is reflected in the normal function of the body as well as pathobiochemical processes in the body.</p> <p>The acquired knowledge and skills provide a biochemical basis for understanding the senior year subjects such as: physiology,</p>				

	pathophysiology, pharmacology, internal medicine.			
<b>Learning outcomes (general and specific competences):</b>	<p><u>General Outcomes:</u></p> <ul style="list-style-type: none"> <li>Applying the independent learning, critical thinking and scientific facts through active listening, work and positive relationships building with members of the group / team.</li> </ul> <p><u>Specific outcomes:</u></p> <ul style="list-style-type: none"> <li>The critical and rational evaluation of the facts about the molecular composition, purpose and dynamics of macromolecular structures in living cells, the molecular logic of biochemical processes in a living organism, the dynamics of the synthesis and degradation of natural macromolecules, proteins, polysaccharides, lipids, nucleic acids.</li> <li>Understanding the basic principles of cell metabolism as well as the principles of its regulation and control.</li> <li>Remembering the biochemical and metabolic arguments to explain the physiological and pathophysiological processes.</li> <li>Understanding the principles and applying the experimental skills of determining kinetic characteristics of enzyme reactions and analysis of enzymes and metabolites in physiological samples.</li> </ul>			
<b>Course content (Syllabus):</b>	The program consists of three parts: physical, organic chemistry and biochemistry; 5 Continuous assessment (examination of stoichiometry, organic chemistry, biochemistry - Part 1, biochemistry - Part 2, and examination of practice); 2 partial exams and final exam.			
<b>Format of instruction (mark in bold)</b>	<b>Lectures</b>	<b>Exercises</b>	<b>Seminars</b>	<b>Independent assignments</b>
	Consultations	Work with mentor	Field work	Other
	Notes: The teacher presents the theoretical material. Students independently scrutinize the assigned topic related to the issues of appropriate teaching units in the form of power-point presentations.			
<b>Student responsibilities</b>	The final exam, 5 continuous assessments, seminars (2x during class); practical part of the output colloquium, attendance and participation in class, especially in problem solving during the seminar			
<b>Screening student work (mark in bold)</b>	Class attendance	<b>Class participations</b>	<b>Seminar essay</b>	<b>Practical training</b>
	<b>Oral exam</b>	<b>Written exam</b>	<b>Continous assesment</b>	Essay

<b>Detailed evaluation within a <i>European system of points</i></b>			
<b>STUDENTS RESPONSIBILITIES</b>	<b>HOURS</b>	<b>PROPORTIONS OF ECTS CREDITS</b>	<b>PROPORTION S OF MARK</b>
Class attendance and participations	30	1	5%
Seminar essay	45	1,5	10%
Kontinuirana provjera znanja (5x)	70	2,5	15%
Written exam	240	8	50%
Oral exam	90	3	20%

Additional explanations:

Since this is a basic course in a specific area of physical, organic chemistry and biochemistry, in addition to lectures, the processing of selected variety of seminar topics and solving tasks helps students to extend their knowledge and to show ability to think critically and to recognize the essential elements of a certain educational issues.

In the final assessment, results of the final examination are included, as well as the activity during lectures, the success of the seminar essays and manner of presentation, activities on practical training and success in the continuous assessment. For the exam access student is required to make all the other aforementioned obligations.

Students have the option of the continuous assessment in stoichiometry and organic chemistry to win a maximum of 10 points, which are added to the first partial exam in chemistry.

Students have the option of the continuous assessment in biochemistry - Part 1 and biochemistry - Part 2, and a colloquium from exercises to win a maximum of 5 points (for a total maximum of 15), which are added to the second partial exam in biochemistry.

The exam is written and oral.

Students have the opportunity to pass the test in Medical Chemistry and Biochemistry Course through:

a) Two tests, which include materials processed in lectures, seminars and exercises:  
 The first term exam after completing the part 1 of teaching (physical and organic chemistry)  
 The second term exam after completing the part 2 of teaching (biochemistry)  
 Students who achieve a total minimum of 60% of points on preliminary exams are freed of the final exam.

b) final exam and regular examination periods: To pass (on the final exam or regular examination period) student should achieve 60% or more points. The unique assessment at the exam is determined on average grade of two tests, continuous assessments (tests), activity during all forms of teaching, and oral exam.

According to the Regulations on studying final grade is obtained as follows:  
 A = 90 to 100% 5 (excellent)  
 B = 80 to 89% 4 (very good)  
 C = 70 to 79% 3 (good)  
 D = 60 to 69% 2 (sufficient)  
 F = 0 to 59% 1 (insufficient)

<p><b>Required literature:</b></p>	<p>For the course Medical Chemistry and Biochemistry is necessary:</p> <p>Priručnik za vježbe iz medicinske kemije i biokemije za studente medicine, I. Mikulić, N. Jelić Knezović, V. Mikulić, K. Landeka. Medicinski fakultet, Mostar 2014.</p> <p>a) <b>Chemistry</b></p> <ol style="list-style-type: none"> <li>1. Z. Pilić, N. Jelić-Knezović, Odabrana poglavlja fizikalne kemije Interna skripta, Mostar, 2016.</li> <li>2. Vančik H. Temelji organske kemije, Udžbenici Sveučilišta u Zagrebu, Intelktualne usluge Hrvoj Vančik, Varaždin, 2012.</li> <li>3. CD power point predavanja iz kemije (ili na: <a href="http://www.mefmo.ba">http://www.mefmo.ba</a>)</li> <li>4. Nastavna štiva. Seminarski zadaci s rješenjima</li> </ol> <p>b) <b>Biochemistry</b></p> <ol style="list-style-type: none"> <li>1. L. Stryer, J. Berg i J. Tymoczko, BIOKEMIJA, Školska knjiga, 2013. (prijevod VI izdanja na hrvatski jezik)..</li> <li>2. Lovrić J, Sertić J. Harperova ilustrirana biokemija (28 izdanje; Murray RK, Bender DA, Botham KM, Kennelly PJ, Rodwell VW i Weil A.), Medicinska naklada Zagreb 2011.</li> <li>3. CD – power point predavanja iz biokemije 1. i 2. (ili na: <a href="http://www.mefmo.ba">http://www.mefmo.ba</a>)</li> <li>4. Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; Medicinska naklada Zagreb, 2009 (fotokopije odabranih poglavlja)</li> <li>5. Karlson P: Biokemija za studente kemije i medicine, Školska knjiga, Zagreb, 1993. 6. Streyer L: Biokemija, Školska knjiga, Zagreb, 1991 (odabrana poglavlja)</li> </ol>
<p><b>Optional literature:</b></p>	<p>a) Chemistry</p> <ol style="list-style-type: none"> <li>1. Atkins P, de Paula J. Physical Chemistry, 8th Ed, Oxford University Press, 2006.</li> <li>2. Filipović I., Lipanović S.: Opća i anorganska kemija I, II, Školska knjiga, Zagreb 1987</li> <li>3. Bregovec I., Deljac A., Sunko D.: Organska kemija, 9. izdanje, Školska knjiga, Zagreb 1996.</li> <li>4. Atkins P.W., Clugston M.J.: Načela fizikalne kemije, Školska knjiga, Zagreb 1992</li> <li>5. J. McMurry. Osnove organske kemije, Medicinski fakultet Sveučilišta u Rijeci, Zrinski d.d., 2014.</li> <li>6. Pine S. H.: Organska kemija, Školska knjiga Zagreb 1994.</li> </ol> <p>b) Biochemistry</p> <ol style="list-style-type: none"> <li>1. Streyer L. Biochemistry, 5th ed. WH Freeman and Company, New York, 2001.</li> </ol>

	<p>2. Michael Lieberman, Allan D. Marks, Colleen Smith: Marksove osnove medicinske biohemije: klinički pristup, Data Status, Beograd, 2008.</p> <p>3. Zilva F, Pannal RP, Mayne DP: Klinička kemija u dijagnostici i terapiji, Školska knjiga, Zagreb, 1992.</p> <p>4. Guyton AC, Hall JE: Medicinska fiziologija, XI izdanje, Medicinska naklada, Zagreb, 2006.</p> <p>5. Sutlović D. Osnove forenzične toksikologije, Redak, Split, 2011.</p>
<b>Additional information about the course</b>	<p>Monitoring methods of teaching quality:</p> <ul style="list-style-type: none"> <li>- student questionnaire</li> <li>- quality analysis by students and teachers</li> <li>- exam results analysis</li> <li>- report of the office for teaching quality</li> <li>- external evaluation (visit of team for quality control)</li> </ul>

ANNEXES: Calendar classes

<b>The number of teaching units</b>	<b>TOPICS AND LITERATURE</b>
<b>I.</b>	Title: Thermodynamics and thermochemistry.
	Short description: The laws of thermodynamics. The internal energy. Enthalpy. Thermochemical laws. Entropy. Gibbs energy. Energy biological systems. Energy balance of biochemical systems.
	Literature: Pilić Z., Jelić-Knezović N.; teaching materials
<b>II.</b>	Title: Chemical equilibrium.
	Short description: The influence of concentration, temperature and pressure on the chemical balance. The equilibrium constant and Gibbs energy. The reaction of isotherms. The compounds rich with energy. Metastable living system.
	Literature: Pilić Z., Jelić-Knezović N.; teaching materials
<b>III.</b>	Title: Solutions
	Short description: Solutions. Water as the solvent. The distribution of the substance in solution. Electrolytes. The acids and alkalis. Buffers. Colligative properties. The osmotically active particles. Colloid-dispersed systems. Precipitation reactions. Colloids and macromolecules.
	Literature: Pilić Z., Jelić-Knezović N.; teaching materials
<b>IV.</b>	Title: Electrochemistry.
	Short description: Electrode potential and electrochemical cells. Gibbs energy of redox reactions. The biological redox systems.
	Literature: Pilić Z., Jelić-Knezović N.; teaching materials
<b>V.</b>	Title: Chemical kinetics.
	Short description: The speed of reaction. Order and molecularity reaction.

	Factors affecting the rate of reaction. Enzymes. Complex reactions. Literature: Pilić Z., Jelić-Knezović N.; teaching materials
<b>VI.</b>	Title: The absorption of light and the photochemical processes. Short description: The absorption spectra. Excited molecules. The quantum yield of photochemical reactions. Photosensitivity. Chemiluminescence. Literature: Pilić Z., Jelić-Knezović N.; teaching materials
<b>VII.</b>	Title: Introduction to Organic Chemistry. Alkanes and cycloalkanes. Stereochemistry. Short description: : Chemical bonds. The theory of molecular orbitals. Hybridization. The theory of acids and bases. Physical properties of organic compounds. Classification of organic compounds. The functional groups. Nomenclature. Alkanes, composition, constitution, isomerism. Configuration. Physical Properties. Conformational analysis. Stereoisomers: enantiomers and diastereomers. Chirality. Fisher projection formula. CIP system nomenclature. Optical activity. Literature: Vančik H. Temelji organske kemije.
<b>VIII.</b>	Title: Alkenes and alkynes Aromatic compounds. Short description: Unsaturated hydrocarbons: alkenes and alkynes, structure and physical properties. E-Z isomerism. Electrophilic addition to alkenes. : Kekule-structure, resonant model and orbital model of benzene. Stability of benzene. Electrophilic aromatic substitution. Literature: Vančik H. Temelji organske kemije.
<b>IX.</b>	Title: The alkyl halides. Alcohols, ethers, thiols, sulfides. Aldehydes and ketones. Short description: Nucleophilic substitution at saturated carbon. Elimination reactions. Classification and physical properties of alcohol. Acidity strength. Disqualifying and susptitucijske reactions. Oxidation alkoholaBiološki important alcohols and phenols. Ethers and epoksidi.Tioli and sulphides. The nature of the carbonyl group. The nucleophilic addition to the carbonyl group. Oxidation and reduction of carbonyl compounds. Literature: Vančik H. Temelji organske kemije.
<b>X.</b>	Title: Amines. Heterocyclic compounds. Carboxylic acid and derivatives. Short description: Amines: structure and physical properties. Basicity of the amine. Heterocyclic compounds. a carboxyl group. Physical Properties. The acidity of the carboxylic acid. Synthesis of carboxylic acids. The carboxylic acid derivatives. Nucleophilic acyl substitution. Esther. Acid anhydrides. Acid chlorides. Amides. Literature: Vančik H. Temelji organske kemije.
<b>XI.</b>	Title: Carbohydrates. Nucleosides, nucleotides and nucleic acids. Amino acids and proteins. Lipids. Short description: Carbohydrates. Classification. Fisher's formula. Epimers. Redox reactions of monosaccharides. Straight-chain and cyclic forms. Anomeric carbon atom. Mutarotation. Haworth formula. Glycosides. Reducing and non-reducing sugars. Disaccharides. Polysaccharides. Nucleosides, nucleotides and nucleic acids. Amino acids. Relative configuration. Zwitterion. Amino acid synthesis. Peptide bond. Connecting

	peptide chains. Proteins. Primary, secondary, tertiary and quaternary structure of proteins. Enzymes. Lipids. Waxes. Fats and oils. Saturated and unsaturated fatty acids. Phospholipids. Sphingolipids. Prostaglandin. Terpenes. Steroids. Literature: Vančik H. Temelji organske kemije.
<b>XII.</b>	Title: The conformation and dynamics of protein structure Short description: Building of proteins: the characteristics of a peptide bond, the role of the weak interaction in preserving the structure. The conformation of polypeptide chains, the importance of amino acid sequence, primary, secondary, tertiary and quaternary struktura. Higher levels in the organization of proteins. Accumulation of protein in vivo. Denaturation and renaturation of the protein. Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XIII.</b>	Title: Proteins in Serum Short description: The types and functions of proteins in the human blood, diagnostic significance and methods Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XIV.</b>	Title: Proteins with special functions: hemoglobin, myoglobin, collagen, elastin Short description: Globular proteins; Hemoglobin- allosteric protein structure, function and regulation, cooperative binding of oxygen; mioglobin- differences between monomers and tetramers. Fibrous proteins: structure of collagen, tropocollagen, primary structure, hydroxylation - prolyl hydroxylase, lysyl hydroxylase, glycosylation, scurvy, cooperation in the organization of collagen fibers, construction and degradation of collagen, osteoporosis. Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XV.</b>	Title: Synthesis of heme, porphyria Short description: The synthesis and degradation of hemoglobin, metabolites synthetic route and times of heme degradation with diagnostic significance; features, methods of determination Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XVI.</b>	Title: Coenzyme, Enzyme catalysis Short description: The principles of enzymatic catalysis, regulation of enzymatic activity Literatura: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XVII.</b>	Title: Clinical significance of enzymes Short description: Structure and localization in the cell clinically important enzymes, tissue's and diagnostic specificity and sensitivity; isoenzymes Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials

<b>XVIII.</b>	Title: Glycolysis
	Short description: The course pathway of glucose, control and regulation, allosteric regulated enzymes, hexokinase, phosphofructokinase, pyruvate kinase, ATP production, the importance of oxidation of NADH and LDH reaction
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XIX.</b>	Title: Gluconeogenesis, Cori cycle
	Short description: The metabolic pathway for the synthesis of glucose from noncarbohydrates precursor, irreversible reactions as checkpoints of gluconeogenesis, flow of Cori cycle
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XX.</b>	Title: Glycogen
	Short description: Glycogen as store form of glucose in the human body, its structure and the way of synthesis and degradation
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXI.</b>	Title: Citric acid cycle
	Short description: Creation of acetyl-CoA from pyruvate, pyruvate dehydrogenase complex-coenzymes and prosthetic groups. Synthesis of citrate and review of responses in the citric acid cycle. Energy changes in reactions and control unwinding CLK.
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXII.</b>	Title: Oxidative phosphorylation
	Short description: The redox potentials and the change of free energy, the inner membrane of mitochondria and localization of respiratory multienzyme complexes, cascade oxidation of coenzyme NADH and FADH <sub>2</sub> , proton pumps and creation of a gradient H <sup>+</sup> , the connection with the phosphorylation and synthesis of ATP, the energy efficiency of the complete oxidation of glucose, regulation of oxidative phosphorylation.
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXIII.</b>	Title: Pentose- phosphate cycle
	Short description: Localization and metabolic pathway of the pentose phosphate cycle, metabolism of fructose, galactose.
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXIV.</b>	Title: Amino acids
	Short description: Synthesis of amino acids, remodeling and the role of biogenic amines
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXV.</b>	Title: Urea Cycle
	Short description: Degradation, transamination of amino acids, the synthesis

	of urea, an overview of reactions governed by urea cycles, energy balance; metabolic defects as a result of lack of urea cycle enzymes
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXVI.</b>	Title: Lipids, characterization
	Short description: Fat, phospholipids, glycolipids and sphingolipids, their chemical properties and biological role.
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXVII.</b>	Title: Beta – oxidation of fatty acids
	Short description: Degradation of fats and free fatty acids, a comparison with the synthesis of fatty acids, the synthesis of ketone bodies. The energy efficiency of the complete oxidation of fatty acids.
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXVIII.</b>	Title: Glycoproteins / proteoglycans
	Short description: In vivo modification of proteins, the structure of glycoconjugates: proteoglycans, glycoproteins, glycolipids. Diseases related to the metabolism of glycoconjugates
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXIX.</b>	Title: Biological properties of the membrane
	Short description: Structure and biological function of cell membranes
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXX.</b>	Title: Reactive oxygen compounds and antioxidants
	Short description: Reactivity and the formation of free radicals, reactions in the body, the interaction of antioxidants
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXXI.</b>	Title: DNA/RNA
	Short description: The structure of nucleic acids; large information capacity of DNA conformation double helix; A, B and Z forms of DNA; organization of the prokaryotic and eukaryotic genome, chemical based replication, DNA polymerase; mechanism of transcription initiation, elongation and termination; Activation of amino acids for protein synthesis; genetic code; Similarities and differences between the translation in prokaryotes and eukaryotes
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA; Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXXII.</b>	Title: Regulation of metabolism
	Short description: Review and connection of biochemical metabolic pathways.
	Literature: Stryer L., Berg J. i Tymoczko J., BIOKEMIJA
<b>XXXIII.</b>	Title: Biochemistry of hormones
	Short description: The structure of hormones, similarities and differences in the structure with relation to their different functions.

	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXXIV.</b>	Title: Biochemistry of vitamins
	Short description: Structure and role of the water soluble vitamins and the fat soluble vitamins, participation in the structure of coenzyme, and the consequences of the lack and excess of vitamins
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; teaching materials
<b>XXXV.</b>	Title: Biochemical aspects of bone tissue
	Short description: The chemical structure of bone, markers of bone resorption and bone formation, important in the diagnosis and prevention of osteoporosis
	Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XXXVI.</b>	Title: The metabolism of water and electrolytes
	Short description: Homeostasis of body fluid compartments, and homeostasis of disordered concentrations of sodium, potassium, chloride; homeostasis of calcium, phosphate, magnesium, possible disorders, forms and methods
	Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XXXVII.</b>	Title: Acid-base balance
	Short description: Features of buffers to maintain the pH of blood, possible disorders and possible ways of compensation
	Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XXXVIII.</b>	Title: Oligo - elements.
	Short description: The essential / nonessential oligo - elements, common features, examples, disorders of concentration of oligo- elements
	Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XXXIX.</b>	Title: Biochemical aspects of muscle tissue
	Short description: The chemical mechanism of muscle contraction, structure and connecting the effects of actin and myosin
	Literature: Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XXVII.</b>	Title: Molecular aspects of digestion and nutrition of carbohydrates
	Short description: Features of carbohydrate absorption, diabetes melitus- diagnostic markers and markers for monitoring the disease and the effects of therapy
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XXVIII.</b>	Title: The metabolism of alcohols
	Short description: The absorption and distribution of ethanol in the body, and metabolism; Laboratory diagnosis of alcoholism, markers of acute and chronic alcoholism.
	Literature: Sutlović D. Osnove forenzične toksikologije, teaching materials

<b>XXIX.</b>	Title: Metabolism of drugs / xenobiotics
	Short description: The role of CYP450, the second phase of metabolism of xenobiotics, as pharmacogenetics
	Literature: : Lovrić J, Sertić J. Harperova ilustrirana biokemija, teaching materials
<b>XL.</b>	Title: Molecular aspects of digestion and nutrition of lipids
	Short description: Absorption, classification and features of clinically important lipids, lipoproteins, hyperlipoproteinemia , methods of lipid
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials
<b>XLI.</b>	Title: Molecular aspects of digestion and nutrition of proteins
	Short description: Features absorption of protein, transamination of amino acids, alanine cycle, ketogenic and glucogenic amino acids..
	Literature: Lovrić J, Sertić J. Harperova ilustrirana biokemija; Čvorišćec D, Čepelak I. Štrausova medicinska biokemija; teaching materials