Komisija za študijske zadeve
UL Medicinske fakultete

Univerza *v Ljubljani*
Medicinska fakulteta

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Course Regime

Course:

Study Programme: Medicine

Year of the Course: 2

Semester: Winter

Course type: Compulsory

Number of ECTS credits: 11

Lecturer(s): Vita Dolžan, Katarina Trebušak Podkrajšek

Participating Organisational Units (Departments and Institutes): Institute of Biochemistry

Parts (Modules) of the Course: /

Date of Issue: 15.9.2018

A. General part

1. Course objectives

The course aims to give the student an understanding and basic knowledge of life processes and their regulation at the molecular level. It introduces theoretical and practical aspects of basic biochemistry and molecular biology processes. The course deals with special topics concerning the maintenance of cell constituents, body fluids and the processes involved in tissue growth and reproduction. Students will get the knowledge of basic concepts in molecular genetics that will help them to understand the molecular basis of genetic disorders.

2. Comprehensive outline of the course organisation

The course is scheduled in winter semester. The courses are held by lecturers, teaching assistants and technicians in the form of lectures, seminars, tutorials, laboratory courses and problem based learning / guided discussions (DOŠ).

Lectures are held three times a week for two hours in Lecture Hall 1, Korytkova 2.
Tuesdays 8 AM-10 AM
Wednesdays 13 AM -14 AM
Thursdays 10 AM - 12 AM

Problem based learning, guided discussions (DOŠ) last two school hours once a week and are held in the Seminar at the Institute for Biochemistry, Vrazov trg 2 in small groups according to the published timetable. During DOŠ the topics from the lectures are discussed in more depth and in the context of clinical correlations, discussion on the lectures and exams' topics is also intended to help prepare the students for the partial and final exams, the results of the partial exams are also discussed.

Practical laboratory courses & seminars are held in small groups according to the published timetable in the seminars/laboratories at the Institute for Biochemistry, Vrazov trg 2. The attendance to practical laboratory courses & seminars is compulsory.
Seminars last for 2 hours and are scheduled before the laboratory courses. The seminars are organised as tutorials and student seminars presentations. The schedule for student seminars presentations is published at the beginning of the academic year. Each student must prepare a seminar / presentation on one chosen topic either alone or in pair with a fellow student from the group. Each student (or the pair, respectively) must prepare a written report on the seminar topic, present the seminar orally to their fellow students in the group and answer the questions relevant to the topic during discussion. The written report on the seminar (Word document, a maximum of 800 words, font size 12, line spacing 1.5) should also include short conclusions (e.g., 3 to 4 points) with the most important findings as well as the most relevant figures from the seminar materials (articles). The student must submit this written report to the teaching assistant at least 14 days ahead of the scheduled oral presentation. The teaching assistant reviews the seminar in 7 days. A revised summary must be submitted to the fellow students from the group at least 5 days prior to the oral presentation, so that they can actively participate in the discussion. Oral presentation of the seminar should last 20 minutes at most, and must be accompanied by relevant slides (PowerPoint). The presentation is followed by discussion with the active participation of all students. During the discussion the teaching assistant also assesses the understanding of the seminar topic by asking additional questions.
Practical laboratory courses last for 3 school hours. Only students who are enrolled in the second study year can participate at the practical courses. A student may participate in the practical course

only after the short written assessment of the readiness for the practical courses by answering 3 short questions, each awarded 1 point. Achieving at least 1.5 points out of 3 confirms that the student has sufficiently mastered the theoretical foundations and understands the principles of the practical work to be carried out and can participate in the practical course. After the end of the practical laboratory course the student has to write the report and answer the questions in the course syllabus book. When the teaching assistant approves the report by signing it, the student has satisfactorily passed this particular practical course.
The attendance at the practical laboratory courses & seminars is compulsory and is checked by keeping the attendance list. The exception is warranted in case of illness, drafting in the military, etc., which should be confirmed with an appropriate certificate. Students with a justifiable cause for not participating in the practical laboratory courses & seminars are allowed to substitute at most two missed courses in the current academic year; if they missed more than two courses they need to send the request for permission to substitute more courses to the head of the Institute of Biochemistry. The student will be notified on the further proceedings by e-mail, so the student's e-mail address should be given in the request. If the student was not allowed to participate at the practical course because failing to achieve 1.5 points during short written assessment, only one laboratory course can be substituted in the academic year.

3. Description of on-going assessment of knowledge and skills

The readiness for the practical laboratory courses is assessed by short written assessment that entails answering 3 short questions, each awarded 1 point (study material: Instructions for the practical laboratory courses at Medical Biochemistry and Laboratory Medicine, articles and seminar summaries). Achieving at least 1.5 points out of 3 (passed) confirms that the student has sufficiently mastered the theoretical foundations and understands the principles of the practical work to be carried out and can participate in the practical course. The student that did not achieve at least 1.5 points (failed) have to demonstrate that they mastered the topic satisfactorily in discussion with the teaching assistant during the next practical course.
Students that failed the short assessment more than twice in the semester must pass a repeated written assessment that includes 5 short assay questions that cover the topics of all seminars (5 short assay questions) and laboratory courses (5 short assay questions) before they can be admitted to the final examination. Similarly, student who failed to complete the laboratory courses before the end of the course must pass the same repeated written assessment before they can be admitted to the final examination.
The student seminar is assessed according to the rating scale for examinations (see below). Student's oral presentation is graded by the fellow students (40 points) and by the teaching assistant (60 points). The fellow students' grade assesses: the structure of the seminar and the logical sequence (10 points), the manner of presentation (clarity, speech/reading, use of learning tools -10 points), timing of presentations (10 points) and interaction/encouragement of discussion with students (10 points). In addition, the teaching assistant assesses these same points as well as the knowledge of the topic (10 points) and the quality of the first of the written report on the seminar (10) points. If the written report for the seminar is not in accordance with the instructions from the course regime, this lowers the final grade of the seminar for half of a grade. In case of copying the seminars (plagiarism) the final grade is negative. If the assessment is not positive, the student has to defend the seminar topic again in discussion with the teaching assistant.
The final grade of the student seminar may contribute to the overall average grade of the three partial exams, but only when a student passed all short written assessments before the laboratory courses. The grade of the student seminar is added to the average score of the three partial written exams, so that:
- Seminar grade of 10 adds additional 5% to the average score of the three partial written exams
- Seminar grade of 9 adds additional 3%

- Seminar grade of 8 adds additional 1%

4. Required conditions for the final examination (Course Exam)

Student has fulfilled the conditions to take the final exam when the practical laboratory courses and student seminar are completed. The practical laboratory courses requirement are meet when all the practical courses are performed and the reports are signed by the assigned demonstrator and short written assessment are passed. The student seminar requirement are meet when there was a successful oral presentation of the seminar and successful discussion that followed.

5. Final assessment and examination of knowledge and skills (Course Exam)

The final exam is written and oral. The exam questions cover the topics of lectures, seminars, laboratory courses, problem based learning and guided discussions. Written examination comprises 40 multiple choice questions and takes 90 minutes. Each question has only one correct answer, which is scored by 1 point. Unanswered question is scored with 0 points, wrong answer or selection of multiple answers (correct and incorrect) is scored with 0 points. To pass the written exam the student must achieve 60% of all scores. The student has to pass the written exam to be admitted to the oral exam. At the third attempt to pass the exam, the student can be admitted to oral exam regardless of the number of collected points in the written exam.
In the case of testing knowledge or skills, the score scale without the negative deductions is used as given bellow:

grade	**percentage achieved at the examination**
unsatisfactory (1 do 5)	0,00 % to 59,99 %
satisfactory (6)	60,00 % to 67,99 %
good (7)	68,00 % to 75,99 %
very good (8)	76,00 % to 83,99 %
very good (9)	84,00 % to 91,99 %
excellent (10)	92,00 % to 100 %

Possibility to pass a written exam with partial written exams:
The student can pass the final written exam with three partial written exams during the semester according to Article 6 of the Regulations for assessment of knowledge and skills for the uniform master's study programmes of medicine and dental medicine; each one consisting of 20 multiple-choice exam questions with one single correct answer. There are no repetitive examination dates for each partial written exams.
Students who achieve at least 60% as the sum of the average of the three partial exams and the grade of the seminar presentation of at least 8, can be admitted to the final oral exam without the written exam if they also successfully passed all the laboratory courses. In these students the final grade of the exam is determined solely by the oral exam
If the student fails the oral exam he/she is no more exempt from the written examination the next time.

The students who apply for the exam and do not show up for any justifiable reason are considered to have failed the exam.

6. Other provisions

Final exam regulations:
Students are required to follow to the *Regulations for assessment of knowledge and skills for the uniform master's study programmes of medicine and dental medicine (*Pravilnik o preverjanju in ocenjevanju znanja in veščin za EMŠ medicina in EMŠ dentalna medicina, 2. 10. 2017) in *Code of the responsible beheviou of the students at the uniform master's study programmes of medicine and dental medicine at Medical faculty, university of Ljubljana* (Kodeks odgovornega obnašanja študentov Medicine in Dentalne medicine Medicinske fakultete UL, 25. 10. 2015).
Students can bring only the pencil, rubber and document for the personal identification when attending any type of assessments of knowledge and skills. Before the exam student has to identify him selves with the photo identification document. Mobile phones (that were silenced) and electronic devices (that enable taking pictures) as well as food, drinks and other personal belongings should be left in the student lockers or at the assigned spaces. During the exam the communication between the students and any kind of copying is not allowed. Exams can be opened only when allowed by the assigned teacher or teaching assistant. All types of assessments of knowledge and skills can be performed only by the student personally and not by any other person in the student's name otherwise both persons involved will be sanctioned. After the exam, student needs to leave the exam with the teacher/assistant. This applies also to the material at the oral examination. If all of the exam materials are not returned, this is treated as the disciplinary offense.

Violation of examination regulations:
If a violation of the examination regulations has been established, the student cannot proceed with the examination of their knowledge and skills and is awarded a failing grade.

Committee exam:
After three unsuccessful assessments of the knowledge, the fourth and the fifth assessment is taken in front of the exam committee composed of three members (examiner and two members). At the sixth assessment one member of the committee must be employed at other department or institute of Faculty of Medicine other than the Institute of Biochemistry.

7. Fundamental study material and Supplement reading

- Marks DB et al., Basic Medical Biochemistry, A Clinical Approach, 2013 (T)
- Devlin TM, Textbook of Biochemistry with Clinical Correlations, new editions (T)
- Instructions for the practical laboratory courses at Medical Biochemistry and Laboratory Medicine 2017 (I)
- Publications on the selected topics of the student seminars for 2018/2019 (S)

8. Exam topics, clinical presentations and skills

1. Transmission of genetic information: DNA replication	·Fundamental mechanisms of DNA replication, enzymes and proteins in regulation of DNA replication ·DNA replication in prokaryotes ·Genomic DNA replication in eukaryotes ·Replication of telomeric DNA ·Mitochondrial DNA replication ·Accuracy of DNA replication ·DNA repair during replication ·Differences in prokaryotic and eukaryotic DNA replication in medical context ·DNA replication inhibitors in medical context	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • I: Isolation and characterization of genomic DNA from blood
2. DNA repair	·Factors influencing the DNA damage ·Mechanisms of DNA repair ·Consequences of non-functional enzymes involved in DNA repair in human	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
3. RNA synthesis	· Characteristics of prokaryotic and eukaryotic nucleotide sequences in RNA synthesis · RNA synthesis, enzymes and proteins in regulation of RNA synthesis in prokaryotes and eukaryotes · Similarities and differences in DNA replication and RNA synthesis · RNA synthesis inhibitors in medical context	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
4. RNA processing	·synthesis of functional mRNA ·synthesis of functional rRNA and tRNA, their role in organisms ·synthesis of functional siRNA in miRNA, their role in organisms	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011

5. Protein synthesis	·Genetic code ·Amino acid activation and its accuracy in protein synthesis ·Steps in the synthesis of cytosolic and other proteins ·Protein synthesis inhibitors and their use in medicine	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
6. Protein processing	·Glycosylation of proteins, impact in organisms ·Amino acid modifications, impact in in organisms ·Processing of collagen and insulin, consequences of non-functional processing in human	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
7. Regulation of gene expression	Mechanisms of regulation of gene expression in prokaryotes and eukaryotes at the level of: · RNA synthesis and stability · co-and post-trasncriptional level - protein synthesis level	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
8. Recombinant DNA technology in medicine	·Restriction enzymes in molecular biology ·Recombinant DNA: production, replication and analysis ·Site directed mutagenesis in cells and tissues ·Nucleic acids hybridization for specific DNA molecules detection in medicine ·Polymerase chain reaction (PCR) in medicine ·DNA sequencing ·Molecular genetics in medical diagnostics and treatment	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • I: PCR detection of glutathione-S-transferase gene deletion • I: Methods for recombinant vector analysis • I: On-line tools for protein analysis
9. The molecular biology of cancer	·Cancer as a genetic disorder ·Molecular mechanisms in carcinogenesis	• Lecture

	·Molecular mechanisms of oncogenes and tumor-suppressor genes ·Molecular genetics basis of targeted cancer treatment	• T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
10. Metabolism	·Characteristics of catabolic and anabolicprocesses ·Substrate activation in metabolism ·Coenzymes in metabolism ·Regulation of metabolism	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • I: Experimental methods for the studies of the metabolism
11. Cell signaling in regulation of metabolism	·Chemical messengers and their role in gene expression in metabolic pathways ·Hormones as chemical messengers, hormone receptors ·Mechanisms of hormone cell signalling in metabolism ·Important kinases in cell signalling ·MAP-kinases pathways in regulation of gene expression	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: Signal transduction • I: On-line tools for protein analysis
12. Biochemical overview of selected hormones	·Hypothalamic hormones: biosynthesis, release and mechanism of action ·Pituitary hormones: biosynthesis, release and mechanism of action ·Thyroid and parathyroid hormones: biosynthesis, release and mechanism of action ·Pancreatic hormones (insulin, glucagon): biosynthesis, release and mechanism of action ·Adrenal medulla hormones(adrenaline): biosynthesis, release and mechanism of action · Steroidogenic hormones (Glucocorticoids, mineralocorticoids, sex hormones): biosynthesis, release and mechanism of action	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011

	·Adipokines: role in metabolism ·Hormones of the gastrointestinal tract, role in metabolism ·Eicosanoids: biosynthesis and mechanism of action ·Inactivation of hormones	
13. Fuel oxidation and ATP	·Metabolic fuels and ATP synthesis ·Oxygen in fuel oxidation ·Sources and fate of acetyl-CoA in metabolism ·The tricarboxylic acid cycle (products, regulation, amphibolic role) ·Electron transport chain and oxidative phosphorylation ·Inhibitors of the electron transport chain and oxidative phosphorylation ·Mechanism of uncoupling proteins and ionophores ·Additional ATP synthesis processes (substrate-level phosphorylation, creatine-kinase and adenylate-kinase reactions) ·Oxidations not involved in electron transport chain and oxidative phosphorylation ·Cytochrome P-450 family enzymes in metabolism	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
14. Reactive oxygen and nitrogen species	·Reactive oxygen (ROS) and nitrogen (RNS) species formation ·Metals in ROS formations ·ROS and RNS characteristics ·Damage in biomolecules caused by ROS and RNS ·Cellular defence against ROS and RNS ·ROS and RNS in medicine	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: ROS • I: Activity of anti-oxidative enzymes and lipid peroxidation in erythrocyte hemolysate
15. Metabolic fuels and dietary components	·Role of digestion in the organism ·Characteristics and role of digestive enzymes ·Digestion regulation and hormones ·Proenzymes of digestive enzymes and their activation	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of

	·Absorption of basic nutrient constituents in enterocytes ·Transport of the digestion products to the organs and tissues ·Enzyme deficiency in relation with the digestion	Biochemistry with Clinical Correlations, 2011
16. Sources of carbohydrates and their digestion	·Exogenous sources of glucose ·Enzymes in carbohydrates digestion ·Carbohydrates digestion products, absorption ·Enzyme and transporters deficiency in relation with carbohydrates digestion	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: Digestion of carbohydrates • I: Digestion of carbohydrates
17. Glucose as the major metabolic fuel, glycolysis	·Hexokinase/glucokinase ·Schematic overview of the aerobic degradation of glucose to the CO_2 and H_2O ·Glycolysis: source of the pyruvate ·Anaerobic glycolysis and its role ·Regulation of the aerobic glycolysis ·Regulation of the anaerobic glycolysis ·Enzyme deficiency in glucose degradation	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: Glucokinase and glucose homeostasis
18. Gluconeogenesis	·Gluconeogenesis and glucose blood homeostasis ·Gluconeogenesis substrates ·Cori cycle in glucose-alanine cycle ·Regulation of the gluconeogenesis ·Enzyme deficiency in gluconeogenesis ·Ethanol metabolism and the relation to the gluconeogenesis	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
19. Glycogen metabolism	·Glycogen as an endogenous source of energy ·Glycogen degradation and regulation ·Glycogen biosynthesis and regulation ·Glycogen storage in liver and muscles and its role	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011

		• I: Quantitative analysis of the glycogen in tissues
20. Metabolism of selected monosaccharides and disaccharides	·Fructose and galactose in glycolysis ·Enzyme deficiencies in fructose and galactose metabolism ·Biosynthesis of lactose and regulation ·Biosynthesis of glucuronic acid ·Glucuronic acid in detoxification of endogenous and exogenous substrates	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
21. Pentose phosphate pathway	·Oxidative and non-oxidative phase ·Important products of the pathway ·Role of the pentose phosphate pathway ·Enzyme deficiency in the pentose phosphate pathway	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
22. Digestion of lipids	·Exogenous origin of fatty acids ·Lipids in the diet ·Enzymes in lipids digestion ·Bile acids: role in digestion and absorption of lipids ·Digestion products of lipids and their absorption in enterocytes ·Synthesis of chylomicrons ·Transport of the digestion products of lipids to the organs and tissues	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: Lipids digestion • I: Lipids digestion
23. Triacylglycerols (TAG) as an energy source	·Characteristics and importance of TAG storage ·Degradation of endogenous lipids, regulation ·Lipases: characteristics and role in lipid metabolism	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
24. Fatty acids (FA): utilization for the energy production	·Schematic overview of the FA oxidation to CO_2 and H_2O ·β-oxidation of FA ·β-oxidation products	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach,

	·Regulation of β-oxidation ·Enzyme deficiency in β-oxidation ·Additional pathways in FA degradation	2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
25. Ketone bodies: utilization for the energy production	·Schematic overview of the biosynthesis of ketone bodies in liver ·Regulation of the biosynthesis of ketone bodies ·Activation and degradation of ketone bodies in peripheral tissues ·Ketone bodies and their role in selected conditions of the organism	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
26. Biosynthesis of fatty acids (FA)	·Enzymes in FA biosynthesis ·Regulation of FA biosynthesis ·FA chain elongation and desaturation ·Comparison of β-oxidation and FA biosynthesis	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
27. Triacylglycerol (TAG) metabolism	·Biosynthesis of TAG ·Regulation of the TAG biosynthesis ·Enzyme deficiency in TAG metabolism ·Glyceroneogenesis: the origin of the glycerol-3-phosphate ·Comparison of the TAG biosynthesis in the liver and in the adipose tissue	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
28. Metabolism of the complex lipids	·Biosynthesis and degradation of phospholipids ·Biosynthesis and degradation of glycolipids ·Enzyme deficiency in the metabolism of complex lipids	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
29. Cholesterol metabolism	·Role of cholesterol in human body ·Sources of cholesterol in human ·Schematic overview of cholesterol and isoprenoids biosynthesis ·Inhibitors of cholesterol biosynthesis and their role in medicine ·Biosynthesis of bile acids	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of

	·Excretion of bile acids and enterohepatic circulation	Biochemistry with Clinical Correlations, 2011
30. Metabolism of the lipoproteins	· Chylomicrons and VLDL in the transport of exogenous and endogenous TAG ·LDL in cholesterol transport ·HDL in reverse cholesterol transport ·Apolipoproteins in the metabolism of the lipoproteins ·Receptors, transporters and enzymes in the metabolism of the lipoproteins ·Disorders of lipoprotein metabolism	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • I: On-line databases for the demonstration of the lipoproteins and their metabolism
31. Metabolism of the eicosanoids	·Polyunsaturated fatty acids in eicosanoid metabolism ·Schematic overview of the biosynthesis of prostaglandins, thromboxane, leukotrienes and eicosanoids ·Regulation of metabolism of eicosanoids ·Inhibitors of eicosanoid biosynthesis and their role in medicine	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
32. Dietary proteins and their digestion	·Dietary proteins ·Enzymes in the digestion of dietary proteins and their activation ·Digestion products and absorption ·Regulation of protein digestion	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: Digestion of proteins • I: Digestion of proteins
33. Metabolism of the endogenous proteins	·Metabolic turnover of proteins ·Degradation of endogenous proteins ·Protein defects in degradation of endogenous proteins and their role in medicine	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011

34. Metabolism of Amino acids	·Pathways of elimination of the amino acid nitrogen ·Transamination and oxidative deamination in degradation of the amino acids ·Toxicity of ammonia ·Alanine and glutamine in ammonia blood transport ·Urea cycle: origin of nitrogen for urea synthesis ·Regulation of urea synthesis ·Enzyme deficiency in urea cycle ·Schematic overview of amino acid degradation ·Enzyme deficiency in amino acid degradation ·Schematic overview of the biosynthesis of the non-essential amino acids	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011 • S: Amino acid metabolism • I: Alanine-transaminase enzyme activity in biological samples
35. Amino acids as the source compounds for the biosynthesis	·Biosynthesis of the glutathione ·Biosynthesis of hem, regulation and inhibition ·Bilirubin and its secretion ·Biosynthesis of biogenic amines, their role ·Tyrosine: biosynthesis of thyroid hormones ·Tyrosine: biosynthesis of catecholamine	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
36. Metabolism of nucleotides	·Biosynthesis of the nucleotides, substrates ·Schematic overview of the biosynthesis of the ribonucleotides ·PRPP biosynthesis of the ribonucleotides *de novo* and in recycling ·Biosynthesis of the deoxynucleotides ·Schematic overview of degradation of ribonucleotides and deoxyribonucleotides ·Regulation of metabolism of nucleotides ·Enzyme deficiency in metabolism of nucleotides ·Inhibitors of the deoxyribonucleotides synthesis and their role in medicine	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011
37. Metabolic characteristics of selected tissues and organs	·Liver and adipose tissue role in fuel availability ·Liver in homeostasis of glucose and cholesterol ·Liver and detoxification of ethanol, xenobiotics, endogenous nitrogen, bilirubin)	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of

	·Metabolic characteristics of skeletal and heart muscle ·Metabolic characteristics of erythrocytes, kidney, bones and brain ·Metabolic characteristics of cancer cells	Biochemistry with Clinical Correlations, 2011
38. Integration of the metabolism	·Metabolic processes after the ingestion of the metabolic fuels and between the meals ·Metabolic processes at prolonged starvation ·Metabolic processes at over-feeding ·Metabolic processes during physical activity	• Lecture • T: Marks DB in sod., Basic Medical Biochemistry, A Clinical Approach, 2013 or Devlin TM, Textbook of Biochemistry with Clinical Correlations, 2011

9. Other information

Students sign in for the final assessment in the VIS system as defined in *Regulations for assessment of knowledge and skills for the uniform master's study programmes of medicine and dental medicine* (Pravilnik o preverjanju in ocenjevanju znanja in veščin za EMŠ medicina in EMŠ dentalna medicina, 2. 10. 2017) in *Code of the responsible beheviou of the students at the uniform master's study programmes of medicine and dental medicine at Medical faculty, university of Ljubljana* (Kodeks odgovornega obnašanja študentov Medicine in Dentalne medicine Medicinske fakultete UL, 25. 10. 2015).

Regulations at the laboratories for the practical laboratory course

Due to the safety reasons it is necessary to follow the specific laboratory regulations. Coats, jackets and other outer garment together with the bags and purses must be left in the student lockers during the practical course, while students need to wear laboratory coats. Food and beverages cannot be ingested nor taken in to the laboratory. In some occasions it is necessary to wear laboratory gloves.
All the communication via e-mails are replied during the working hours.