

Subject:	Medical Biochemistry 1	Code:	ULCHBKB/MBCH-GM1/20
Study Programme:	General Medicine	Study Period:	3. semester
Evaluation:	exam	Subject Type:	compulsory
Content:	2 h lectures and 3 h practical exercises / week		Total 70 hours

Department: **Department of Medical and Clinical Biochemistry, UPJŠ in Košice, FM**

Week	Lectures http://portal.lf.upjs.sk	Practical Lessons http://portal.lf.upjs.sk Seminars from Medical Biochemistry
1.	CELL BIOCHEMISTRY - General features of cell metabolism - The cell and subcellular localization of biochemical processes - Redox processes and their energetics - Biological membranes, transport in cells	Principles of biochemical laboratory techniques 1. Safety in biochemical laboratory Seminar 1. Revision of Bioorganic chemistry 2. Biochemical properties of aqueous solutions, Buffers
2.	ENZYMES – CLASSIFICATION, COFACTORS - The role of enzymes in metabolism - Enzymes – structure, specificity, activity, units, mechanism of action - Classification and nomenclature of enzymes - Cofactors – classification, mechanism of action - Metal ions as cofactors	Seminar 1. The cell and cellular organelles from a biochemical perspective 2. Phosphate transfer reactions and the formation of macroergic (high-energy) compounds 3. Oxidation-reduction processes in the cell 4. Cellular membranes (p. 31) 5. Membrane transport (p.33)
3.	KINETICS AND REGULATION OF ENZYMES - Kinetics of enzymatic reactions – Michaelis-Menten equation, inhibitors - Factors affecting the rate of enzymatic reactions - Regulation of enzymatic activity - Allosteric enzymes - Diagnostically important enzymes	Enzymes – classification, general characterization 1. Effect of pH on the activity of α -amylase Seminar 1. Classification of enzymes (p. 15) 2. Principle of enzymatic catalysis (p. 16) 3. Coenzymes (p. 8)
4.	DIGESTION OF SACCHARIDES AND METABOLISM OF GLUCOSE - Digestion and absorption of saccharides - Transport of glucose - Glycolysis – reactions, enzymes, regulation, energetic balance, and importance - Gluconeogenesis – reactions, enzymes, regulation, energetic balance, and importance - Glycemia and regulation of glucose metabolism	Enzymes – kinetics and regulation of enzymes 1. Activation and inhibition of α -amylase by inorganic ions 2. Calculation of the V_{max} and K_M of enzyme-catalyzed reactions (homework) Seminar 1. Kinetics of enzymatic reactions (p. 17) 2. Inhibition of enzymatic activity (p. 19) 3. Factors affecting the velocity of enzymatic reaction (p. 21) 4. Enzymes in clinical diagnosis (p. 23)
5.	METABOLISM OF MONOSACCHARIDES AND THEIR DERIVATIVES - The pentose-phosphate pathway – reactions, enzymes, importance - Metabolism of other monosaccharides (e.g. galactose, mannose, fructose) - Metabolism of monosaccharide derivatives (e.g. amino saccharides, glucuronic acid)	Principal metabolic pathways of saccharide metabolism 1. Detection of lactic acid Seminar 1. Metabolism of saccharides (p. 58) 2. Glycolysis and gluconeogenesis (p. 63)
6.	METABOLISM OF POLYSACCHARIDES - Metabolism of glycogen – reactions, enzymes, regulation - Metabolism of glycosaminoglycans (GAGs) – reactions, enzymes, biomedical importance - Metabolism of glycoproteins – reactions, enzymes, biomedical importance	Seminar 1. Preparation for the first revision test 2. Revision of Enzymes 3. Revision of Carbohydrate metabolism 4. Digestion of carbohydrates (p. 58) 5. Glucose transport into the cell (p. 61)

7.	1st Revision test* (1. – 6. week) METABOLISM OF SACCHARIDES – OVERVIEW - Glucose-6-phosphate – importance in the metabolism of saccharides - Disorders in metabolism of saccharides	Metabolism of saccharides and their derivatives 1. Enzymatic determination of glucose in blood Seminar 1. Glucose in blood (p. 68) 2. Diagnostic tests for detection of saccharide metabolism disorders e.g. OGTT, glycosylated hemoglobin 3. Clinically significant saccharides (p. 77)
8.	CITRIC ACID CYCLE AND RESPIRATORY CHAIN - Oxidative decarboxylation of pyruvate, Acetyl-CoA - The citric acid cycle – reactions, enzymes, regulations and energetic balance - Anaplerotic reactions of citric acid cycle - The respiratory chain – oxidative phosphorylation - Inhibitors and uncouplers of the respiratory chain	Metabolism of polysaccharides 1. Isolation and detection of glycogen from liver Seminar 1. Glycogen (p. 70) 2. Metabolism of polysaccharides, glycosaminoglycans, glycoproteins (p. 74)
9.	METABOLISM OF SIMPLE LIPIDS - Digestion and absorption of lipids - Oxidation of fatty acids (FA) - Ketone bodies – metabolism, importance - Biosynthesis of FA – reactions, enzymes, regulation - Eicosanoids – classification, metabolism, biomedical importance	Biological oxidations 1. Detection of dehydrogenases in animal tissue Seminar 1. Respiratory chain (p. 44) 2. Citric acid cycle (p. 52)
10.	METABOLISM OF TAG AND CHOLESTEROL - Metabolism of triacylglycerols (TAG) - Metabolism of cholesterol – transport, reactions, regulation, importance - Bile acids – metabolism, function - Synthesis and degradation of steroid hormones	Metabolism of simple lipids 1. Hydrolytic cleavage of lipids by lipase Seminar 1. Digestion and metabolism of lipids (p. 83) 2. Oxidation and biosynthesis of FA (p. 84) 3. Ketone bodies (p. 89) 4. Eicosanoids (p. 90)
11.	METABOLISM OF COMPLEX LIPIDS - Metabolism of phospholipids and sphingolipids - Lipoproteins – composition, function, metabolism, biomedical importance - Disorders of lipid metabolism - Diagnostic importance of lipids	Seminar 1. Preparation for the second revision test 2. Revision of Metabolism of saccharides 3. Metabolism of lipids
12.	2nd Revision test* (7. – 11. week) DNA REPLICATION, TRANSCRIPTION - Organization of genetic material in DNA (genes) - Replication and repair of DNA, inhibitors of DNA synthesis - Transcription - biosynthesis of RNA, inhibitors - Reverse transcription – e.g. HIV virus	Metabolism of complex lipids 1. Determination of the lipid profile 2. Determination of TAG by calculation. Calculation of HDL and LDL cholesterol Seminar 1. Metabolism of cholesterol and steroids (p. 100) 2. Lipoproteins (p. 94) 3. Diagnostic importance of lipids (p. 104)
13.	PROTEOSYNTHESIS - Translation of mRNA – regulation, inhibition - Cotranslational modification of proteins - Synthesis of secretory and membrane proteins - Posttranslational modifications of proteins - Distribution of the newly synthesized proteins	Biochemistry of nucleic acids 1. Students' presentations Seminar 1. Replication (p. 142) 2. Transcription (p. 144) 3. Translation (p.146)
14.	3rd Revision test – practical exercises, seminars* REGULATION OF GENE EXPRESSION - The principles of gene expression and regulation - Methods of studying nucleic acids (NA) – e.g. sequencing, amplification (PCR) - Use of NA analysis techniques in diagnostics	Credit week 1. Final evaluation of practical exercises 2. Credit donation

* After writing the revision test, students can view the evaluation of their answers within one week