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 2. Isolation of erythrocytary membranes and detection of lipoid phosphate ***Seminar:*** 1. Cellular membranes (p. 31) 2. Membrane transport (p. 33)
2.	**ENZYMES AND THEIR ROLE IN METABOLISM** - The role of enzymes in metabolism - Enzymes – structure, specificity, activity, units, mechanism of action - Kinetics of enzymatic reactions – Michaelis-Menten equation, inhibitors - Factors affecting the rate of enzymatic reactions	**Enzymes I** 1. Determination of *α-amylase* activity in blood serum 2. Detection of catalase activity ***Seminar:*** 1. Classification of enzymes (p. 15) 2. Principle of enzymatic catalysis (p. 16)
3.	**CLASSIFICATION AND COFACTORS OF ENZYMES** - Classification and nomenclature of enzymes - Cofactors – classification, mechanism of action - Metal ions as cofactors - Regulation of enzymatic activity - Allosteric enzymes - Diagnostically important enzymes	**Enzymes II** 1. Calculation of the V_{max} and K_m of enzyme-catalyzed reactions 2. Activation and inhibition of *α-amylase* by inorganic ions ***Seminar:*** 1. Kinetics of enzymatic reactions (p. 17) 2. Inhibition of enzyme activity (p. 19)
4.	**METABOLISM OF MONOSACCHARIDES I** - Digestion, absorption and transport of saccharides - Glycolysis – reactions, enzymes, regulation, energetic balance, and importance - Formation and transport of reduced coenzymes - Gluconeogenesis – reactions, enzymes, regulation, energetic balance, and importance	**Enzymes III** 1. Effect of pH on the activity of *α-amylase* 2. Effect of temperature on the activity of *α-amylase* ***Seminar:*** 1. Factors affecting the velocity of enzymatic reaction (p. 21) 2. Cofactors (p. 8) 3. Enzymes in medicine (p. 23)
5.	**METABOLISM OF MONOSACCHARIDES II** - The pentose-phosphate pathway (PPP) – reactions, enzymes, importance - Metabolism of other monosaccharides (e.g. galactose, mannose, fructose) - Metabolism of monosaccharide derivatives (e.g. amino saccharides, glucuronic acid) - Regulation of saccharide metabolism – glycemia	**Metabolism of saccharides I** 1. Detection of glycolysis intermediates 2. Detection of lactic acid ***Seminar:*** 1. Metabolism of saccharides (p. 58) 2. Glycolysis (p. 63) and gluconeogenesis (p. 66)
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	**Metabolism of saccharides II** 1. Substrate specificity of glycosidases ***Seminar:*** 1. Glucose transport into the cell (p. 61) 2. Pentose-phosphate pathway (p. 67) 3. Glucose in blood (p. 68)

7.	**1st Revision test*** **METABOLISM OF SACCHARIDES – OVERVIEW** - Glucose-6-phosphate – importance in the metabolism of saccharides - Disorders in metabolism of saccharides	**Metabolism of polysaccharides** 1. Isolation and detection of glycogen from liver ***Seminar:*** 1. Glycogen (p. 70) 2. Importance derivatives of monosaccharides (p. 73)
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 - The respiratory chain – oxidative phosphorylation - Inhibitors and uncouplers of respiratory chain	**Metabolism of saccharides III** 1. Enzymatic determination of glucose in blood ***Seminar*** 1. Diagnostic tests for detection of saccharide metabolism disorders e.g. OGTT, glycosylated hemoglobin 2. Clinically significant carbohydrates (p. 77)
9.	**METABOLISM OF FATTY ACIDS** - Digestion and resorption of lipids - Oxidation of fatty acids (FA) – saturated, unsaturated, with an odd number of carbon atoms - Ketone bodies – metabolism, importance - Biosynthesis of FA – reactions, enzymes, regulation	**Biological oxidations** 1. Detection of dehydrogenases in animal tissue ***Seminar:*** 1. Respiratory chain (p. 44) 2. Citric acid cycle (p. 52)
10.	**METABOLISM OF LIPIDS** - Metabolism of triacylglycerols (TAG) - Metabolism of phospholipids and sphingolipids - Eicosanoids – classification, metabolism, biomedical importance - Lipoproteins – composition, function, metabolism, biomedical importance	**Metabolism of lipids I** 1. Hydrolytic cleavage of lipids by lipase 2. Determination of lipase activity ***Seminar:*** 1. Metabolism of lipids (p. 84)
11.	**METABOLISM OF CHOLESTEROL** - Metabolism of cholesterol – transport, reactions, regulation, importance - Bile acids – metabolism, function - Synthesis and degradation of steroid hormones - Disorders of lipid metabolism	**Metabolism of lipids II** 1. Determination of total lipids 2. Determination of TAG by calculation ***Seminar:*** 1. Eicosanoids (p. 90) 2. Lipoproteins (p. 92)
12.	**2nd Revision test*** **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 lipids III** 1. Determination of cholesterol 2. Calculation of HDL and LDL cholesterol ***Seminar:*** 1. Metabolism of steroids (p. 100) 2. Significance of lipids in diagnostics (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. Virus detection (e.g. HIV, SARS-CovII) **3rd Revision test** – practical exercises, seminars* ***Seminar:*** 1. Replication (p. 142), transcription (p. 144), translation (p. 146)
14.	**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 ***Seminar:*** 1. Methods used in analysis of nucleic acids (p. 150)

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