

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	<i>Lectures</i> http://portal.lf.upjs.sk	<i>Practical Lessons</i> 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. Introduction to clinical biochemistry 3. Isolation of erythrocytary membranes and detection of lipid phosphate Seminar: 1. Cellular membranes (p. 31) 2. Membrane transport (p. 33)
2.	ENZYMES I - The role of enzymes in metabolism - Structural features of enzymes, active site, specificity, enzyme classification - Mechanism of catalysis - Kinetics of enzymatic reactions - Michaelis –Menten equation	Enzymes I 1. Determination of α -amylase activity in blood serum 2. Test of catalase activity Seminar: 1. Classification of enzymes (p. 15) 2. Principle of enzymatic catalysis (p. 16)
3.	ENZYMES II - Enzyme activity, inhibition of enzymatic activity - Kinetics of inhibited enzymatic reactions - Factors affecting the rate of enzymatic reactions - The principles of 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 types of enzymatic activity (p. 19)
4.	METABOLISM OF SACCHARIDES I - Introduction to the metabolism of saccharides - Digestion of saccharides - Transport of saccharides - Glycolysis – importance and energy balance - Regulation of glycolysis	Enzymes III 1. Effect of temperature on the activity of α -amylase 2. Effect of pH on the activity of α -amylase Seminar: 1. Factors affecting the velocity of enzymatic reaction (p. 21) 2. Coenzymes (p. 8) 3. Enzymes in clinical diagnosis (p. 23)
5.	METABOLISM OF SACCHARIDES II - Gluconeogenesis, regulation of gluconeogenesis - The pentose phosphate pathway - Metabolism of synthesis and degradation of glycogen - Metabolism of galactose, mannose and fructose	Metabolism of saccharides I 1. Substrate specificity of glycosidases 2. Detection of glycolysis intermediates 3. Detection of lactic acid Seminar: 1. Metabolism of saccharides (p. 58) 2. Glycolysis and gluconeogenesis (p. 63)
6.	1st Revision test METABOLISM OF SACCHARIDES III - Metabolism of uronic acids - Metabolism of aminosaccharides - Metabolism of glycosaminoglycans and glycoproteins - Regulation of saccharide metabolism	Metabolism of saccharides II 1. Enzymatic determination of glucose in blood Seminar: 1. Glucose in blood (p. 68) 2. Glycogen (p. 70)

7.	<p>METABOLISM OF SACCHARIDES IV</p> <ul style="list-style-type: none"> - Glucose-6-phosphate – importance in the metabolism of saccharides - Disorders in metabolism of saccharides 	<p>Metabolism of saccharides III</p> <ol style="list-style-type: none"> 1. Isolation and detection of glycogen from liver <p>Seminar:</p> <ol style="list-style-type: none"> 1. Clinically significant carbohydrates (p. 77)
8.	<p>CITRIC ACID CYCLE</p> <ul style="list-style-type: none"> - Oxidative decarboxylation of pyruvate - Acetyl-CoA – biochemical significance - The citric acid cycle – reactions, enzymes, regulations - Energetic balance of citric acid cycle - Anaplerotic reactions 	<p>Metabolism of saccharides IV</p> <ol style="list-style-type: none"> 1. Diagnostic tests for detection of carbohydrate metabolism disorders <p>Seminar</p> <ol style="list-style-type: none"> 1. Oral glucose tolerance test 2. Urine glucose test 3. Glycosylated hemoglobin test
9.	<p>RESPIRATORY CHAIN</p> <ul style="list-style-type: none"> - The respiratory chain - electron transport and oxidative phosphorylation - Factors affecting the respiration - Inhibitors, uncouplers. - The other redox systems 	<p>Biological oxidations</p> <ol style="list-style-type: none"> 1. Detection of dehydrogenases in animal tissue <p>Seminar:</p> <ol style="list-style-type: none"> 1. Citric acid cycle (p. 52) 2. Respiratory chain (p. 44)
10.	<p>METABOLISM OF SIMPLE LIPIDS I</p> <ul style="list-style-type: none"> - Digestion and resorption of lipids - β-oxidation of FA (e.g. saturated, unsaturated) - α, ω-oxidation of fatty acids (FA) - Formation of ketone bodies and their utilization - Biosynthesis of FA - Regulation of FA degradation and synthesis 	<p>Lipids metabolism I</p> <ol style="list-style-type: none"> 1. Hydrolytic cleavage of lipids by lipase 2. Determination of lipase activity in blood serum of patient <p>Seminar:</p> <ol style="list-style-type: none"> 1. Metabolism of lipids and steroids (p. 83) 2. Significance of lipids in diagnostics (p. 104)
11.	<p>METABOLISM OF SIMPLE LIPIDS II</p> <ul style="list-style-type: none"> - Biosynthesis and degradation of triacylglycerols - Biosynthesis and biomedical significance of cholesterol - Cholesterol – transport, regulation of metabolism - Formation and importance of bile acids - Synthesis and degradation of steroid hormones 	<p>Lipids metabolism II</p> <ol style="list-style-type: none"> 1. Determination of triacylglycerols in blood serum 2. Determination of total lipids in blood serum <p>Seminar:</p> <ol style="list-style-type: none"> 1. Eicosanoids (p. 90)
12.	<p style="color: red;">2nd Revision test</p> <p>METABOLISM OF LIPIDS III</p> <ul style="list-style-type: none"> - Lipoproteins – definition, function, metabolism - Synthesis and degradation of phospholipids and sphingolipids 	<p>Lipids metabolism III</p> <ol style="list-style-type: none"> 1. Determination of cholesterol in blood serum 2. Calculation of HDL and LDL cholesterol <p>Seminar:</p> <ol style="list-style-type: none"> 1. Lipoproteins (p. 92) 2. Metabolism of steroids (p. 100)
13.	<p>METABOLISM OF LIPIDS IV</p> <ul style="list-style-type: none"> - Complex lipids - metabolism, regulation, importance - Eicosanoids – characterization, classification, metabolism, biomedical importance - Disorders in metabolism of lipids 	<p>Cinical-biochemical diagnostic</p> <ol style="list-style-type: none"> 1. Factors affecting results of biochemical examination (p. 198) 2. Evaluation of the results of biochemical examinations of fictive patient <p style="color: red;">3rd Revision test – practical exercises, seminars</p>
14.	<p>OXIDATION STRESS</p> <ul style="list-style-type: none"> - Characterization of free radicals - Formation and conversions of free radicals in the organism - mechanism of oxidative damage, antioxidants - Reactive oxygen and nitrogen species – diseases and aging, cell signalization 	<p>Credit week</p> <ol style="list-style-type: none"> 1. Final evaluation of practical exercises 2. Credit donation