Subject:	**Medical Biochemistry 1**	**Code:**	*ULCHBKB/LB-ZL1/25*
Study Programme:	*Dental Medicine*	**Study Period:**	*3. semester*
Evaluation:	*graduated*	**Subject Type:**	*compulsory*
Content:	*2 h lectures and 3 h practical exercises / week*		*Total 70 hours*

Workplace: **Department of Medical and Clinical Biochemistry UPJŠ FM**

Week	***Lectures*** **http://portal.lf.upjs.sk**	***Practical Lessons and Seminars*** **http://portal.lf.upjs.sk** **Seminars from Medical Biochemistry**
1.	**CELL BIOCHEMISTRY** - General characteristics of cell metabolism - Energetics of biological redox processes - Macroergic compounds, energetically coupled reactions - Subcellular localization of biochemical processes - Biological membranes, cellular transport	***Principles of biochemical laboratory techniques*** 1. Safety in biochemical laboratory ***Biological fluids*** 1. Buffering capacity of saliva 2. Antioxidant properties of saliva
2.	**SACCHARIDES AND THEIR DERIVATIVES** - Biologically significant monosaccharides, disaccharides and their derivatives - Oligosaccharides, polysaccharides and their importance - The role of complex saccharides (peptidoglycans, proteoglycans, glycoproteins) in metabolism	***Cellular membranes*** 1. Isolation of erythrocyte membranes and detection of lipoid phosphate ***Seminar:*** 1. Cellular membranes (p. 31) 2. Membrane transport (p. 33)
3.	**LIPIDS AND STEROIDS** - Fatty acids - Eicosanoids – medical importance - Triacylglycerols (TAG), sphingolipids - Complex lipids (phospholipids, glycolipids, lipoproteins) - Derived lipids – classification, importance	***Chemical properties of saccharides*** 1. Reactions of monosaccharides and disaccharides 2. Detection of starch ***Seminar:*** 1. Complex saccharides and their importance
4.	**AMINO ACIDS, PEPTIDES AND PROTEINS** - Amino acids (AA) – structure, properties, classification, terminology, reactions - Medically important derivatives of AA - Peptides – peptide bond, classification, properties - Biochemically important peptides (e.g. glutathione) - Proteins – structure, classification, properties, function - Biochemically important proteins (e.g. hemoglobin, elastin, collagen)	***Chemical properties of lipids*** 1. Hydrolysis of neutral lipids 2. Detection of cholesterol ***Seminar:*** 1. Complex lipids and their importance
5.	**NUCLEIC ACIDS** - Nucleotides and nucleosides - DNA – structure, function, biological properties - RNA – structure, function, biological properties - Hydrolysis and detection of NA - Methods used NA in diagnostics (e.g. PCR) **OTHER MEDICALLY IMPORTANT COMPOUNDS** - Terpenes, alkaloids and flavonoids – structure, properties, biological significance - Vitamins – structure, properties, biochemical significance	***Reactions of AA*** 1. Ninhydrin reaction 2. Xanthoprotein reaction ***Chemical properties of proteins*** 1. Detection of peptide bond – biuret reaction 2. Protein precipitation 3. Salivary protein precipitation ***Seminar:*** 1. Structure, composition and importance of hemoglobin, collagen, elastin
6.	**1st REVISION TEST*** **ENZYMES AND THEIR ROLE IN METABOLISM** - Enzymes as biocatalysts – structure, specificity, activity, units, mechanism of action - Classification of enzymes - The role of enzymes in metabolism	***Nucleic acids*** 1. Isolation of nucleoproteins 2. Determination of nucleoprotein composition ***Seminar:*** 1. Restriction enzymes, possibilities of their use (p. 151) 2. Electrophoretic detection of DNA (p. 156)

7.	**KINETICS, REGULATION AND COFACTORS OF ENZYME REACTIONS** - Kinetics of enzyme reactions – Michaelis Menten equation, inhibitors - Regulation of enzyme activity - Cofactors – classification, mechanism of action - Medically significant enzymes	***Enzymes and their role in metabolism*** 1. Detection of the catalase activity 2. Substrate specificity of glycosidases ***Seminar:*** 1. Classification and catalytic activity of enzymes (p. 15) 2. Enzymes in clinical diagnostics (p. 23)
8.	**CITRIC ACID CYCLE AND RESPIRATORY CHAIN** - Oxidative decarboxylation of pyruvate – Acetyl-CoA - Citric acid cycle (CAC) – reactions, enzymes - Regulation and energy balance of the CAC - Anaplerotic reactions - Formation and transport of reduced coenzymes - Respiratory chain – oxidative phosphorylation - Inhibitors and uncouplers of the respiratory chain	***Kinetics of enzyme reactions*** 1. Effect of temperature and pH on the activity of salivary *α-amylase* 2. Activation and inhibition of *α-amylase* by inorganic ions ***Seminar:*** 1. Coenzymes (p. 8) 2. Kinetics of enzymatic reactions (p. 17) 3. Factors affecting the velocity of enzyme reaction (p. 21)
9.	**METABOLISM OF SIMPLE SACCHARIDES** - Saccharide digestion, absorption and transport - Glycolysis and gluconeogenesis – reactions, regulation - The pentose-phosphate pathway - Metabolism of fructose, galactose, and mannose - Regulation of monosaccharide metabolism - glycemia	***Biological oxidations*** 1. Detection of dehydrogenases in animal tissue ***Seminar:*** 1. Respiratory chain and oxidative phosphorylation (p. 38, p. 44) 2. Citric acid cycle (p. 52)
10.	**METABOLISM OF POLYSACCHARIDES AND COMPLEX SACCHARIDES** - Glycogen – metabolism and regulation - Formation of glucuronic acid and its importance - Metabolism of aminosaccharides - Metabolism of GAG and glycoproteins - Disorders of saccharides metabolism	***Metabolism of glucose*** 1. Detection of glycolysis intermediates 2. Detection of lactic acid ***Seminar:*** 1. Glucose transport (p. 61) 2. Glycolysis (p. 63) and gluconeogenesis (p. 66) 3. Glycemia (p. 68)
11.	**METABOLISM OF SIMPLE LIPIDS** - Digestion of lipids - β−oxidation of fatty acids (FA) and their biosynthesis - Metabolism of ketone bodies and their significance - Biosynthesis of eicosanoids and their importance - Metabolism of triacylglycerols (TAG)	***Metabolism of saccharides*** 1. OGTT, glycated hemoglobin 2. Isolation and detection of glycogen in the liver ***Seminar:*** 1. Glycogen (p. 70) 2. Metabolism of complex saccharides (p. 74)
12.	**2nd REVISION TEST*** **METABOLISM OF COMPLEX LIPIDS** - Metabolism of phospholipids, glycolipids and sphingolipids - Lipoproteins – composition, function, importance	***Metabolism of lipids*** 1. Determination of total lipids 2. Calculation of TAG ***Seminar:*** 1. Metabolism of lipids (p. 84) 2. Eicosanoids (p. 90)
13.	**METABOLISM OF STEROIDS** - Metabolism of cholesterol - Cholesterol as precursor of biologically active compounds – bile acids, steroid hormones, vitamin D - Diagnostic significance of lipids	***Metabolism of lipoproteins and cholesterol*** 1. Determination of cholesterol 2. Calculation of HDL and LDL cholesterol **3rd REVISION TEST – practical exercises, seminars*** ***Seminar:*** 1. Lipoproteins (p. 92) 2. Metabolism of steroids (p. 100)
14.	**OXIDATIVE STRESS** - Reactive oxygen and nitrogen species - Mechanisms of oxidative damage to FA and proteins - Antioxidant protection in the body - Natural antioxidants	***Seminar:*** 1. Significance of lipids in diagnostics (p. 104) ***Individual evaluation of student work*** 1. Credit allocation

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