Content of lectures, practical exercises and seminars

Subject:	**Medical Biochemistry 2**	**Code:**	*ULCHBKB/MBCH-GM2/20*
Study Programme:	*General Medicine*	**Study Period:**	*4. semester*
Evaluation:	*exam*	**Subject Type:**	*compulsory*
Content:	*3 h lectures and 3 h practical exercises / week*		*Total 84 hours*

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

Week	***Lectures*** **http://portal.lf.upjs.sk**	***Practical Lessons*** **http://portal.lf.upjs.sk** **Seminars from Medical Biochemistry**
1.	**METABOLISM OF AMINO ACIDS I.** - The role of amino acids (AAs) and proteins in metabolism - Digestion of peptides and proteins in the GIT - General metabolism of AAs - Transport and detoxification of ammonia, the Urea cycle - Metabolic transformation of individual AAs	***Metabolism of proteins*** 1. The safety rules in the laboratory 2. Determination of total concentration of proteins (patient) ***Seminar:*** 1. Protein digestion (p. 109) 2. Protein metabolism (p. 111)
2.	**METABOLISM OF AMINO ACIDS II.** - Biosynthesis of individual AAs - Biosynthesis of catecholamines and tetrapyrroles - Biogenic amines formation - Transport and interorgan exchange of amino acids - Pathobiochemistry of amino acid metabolism	***Degradation of amino acids*** 1. Determination of ammonia 2. Determination of urea (patient) ***Seminar:*** 1. Amino acid metabolism (p. 112) 2. Detoxification of ammonia (p. 128)
3.	**METABOLISM OF NUCLEOTIDES** - Synthesis of ribonucleotides and deoxyribonucleotides – synthesis - Degradation of nucleotides - Salvage reaction (recycling reactions) - Regulation of nucleotide synthesis - Disorders of nucleotide metabolism	***Amino acids and biogenic amines*** 1. Determination of AST in blood serum (patient) 2. Determination of creatinine (patient) ***Seminar:*** 1. Amino acid decarboxylation (p. 114) 2. Biosynthesis of non-essential amino acids (p. 126)
4.	**INTERMEDIARY METABOLISM** - Role of Acetyl-CoA in metabolism - Metabolic interrelation of substrate metabolism - General principles of regulation **INTERNAL ENVIRONMENT** - Body fluids – water, electrolytes - Acid-base balance (ABB) – buffering systems - Basic parameters of ABB, ABB disorders	***Metabolism of nucleotides*** 1. Determination of uric acid (patient) 2. *Case reports:* disorders of amino acid and nucleotide metabolism ***Seminar:*** 1. Metabolism of nucleotides (p. 131) 2. Disorders in the metabolism of N-containing compounds (p. 137)
5.	**BIOCHEMISTRY OF BLOOD** - Erythrocyte metabolism - Tetrapyrrole pigments of human blood and tissues - Disorders of porphyrin metabolism - Role of blood plasma proteins - Blood clotting, inherited disorders of blood clotting	***Internal environment*** 1. Models of acid-base balance 1. Determination of chlorides in blood plasma ***Seminar:*** 1. Biochemistry of the internal environment (p. 159) 2. Acid-base balance (p. 165)
6.	**CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS** - Neurotransmitters - Hormones - chemical structure of hormones - Receptors – structure, classification, properties, signal transduction pathways - Apoptosis	***Biochemistry of blood*** 1. Determination of bilirubin in blood serum (*patient*) 2. Intermediary metabolism – relationship ***Seminar:*** 1. Blood (p. 163) 2. Metabolism of tetrapyrroles (p. 133)

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7.	**1. REVISION TEST*** **DIGESTIVE SYSTEM** - Oral cavity - Stomach, pancreas - Small and large intestine - Digestion enzymes, resorption of nutrients	***Chemical communications*** 1. POCT – determination of vitamin D ***Seminar:*** 1. Hormones – physiology, biochemical properties
8.	**LIVER** - Biochemical function of the liver - Disorders of liver metabolism - Investigated clinical-biochemical parameters **METABOLISM OF FOREIGN COMPOUNDS - XENOBIOCHEMISTRY** - Classification and resorption of xenobiotics - Metabolism of xenobiotics, biotransformation reactions	***Disorders of gastric secretion/hormonal regulation*** 1. Determination of HCl output by the gastric mucosa 2. Determination of HCO_3^- ***Seminar:*** 1. Digestive system (p. 188) 2. Diagnostically important enzymes (p. 27)
9.	**KIDNEY** - Metabolism of the kidney - Ultrafiltration, reabsorption, secretion - Roles of kidney in homeostasis - Use of creatinine, urea and other markers to assess kidney functions	***Metabolism of liver*** 1. Determination of ALT in blood serum (patient) 2. Determination of γ-glutamyl transferase activity (patient) ***Seminar:*** 1. Liver (p. 195) 2. Metabolism of xenobiotics (p. 200)
10.	**BIOCHEMISTRY OF MUSCLE TISSUE** - Organization of muscle fibre, proteins of muscle tissue - Contraction – relaxation cycle in skeletal, heart, and smooth muscle - Regulation of muscle function - Energy sources for muscle work	***Metabolism of kidney*** 1. Biochemical examination of urine (patient) 2. Determination of creatinine in urine – clearance (patient) **Seminar:** 1. Kidney (p. 206) 2. Clinical-biochemical examinations of urine (p. 239)
11.	**METABOLISM OF HARD TISSUE** - Composition of bones and teeth - Synthesis and degradation of collagen - Mineralization and demineralization - Proteins of connective tissue - Bone remodelling cycle, regulation of remodelling - Function and regulation of calcium and phosphorus	***Muscle tissue metabolism*** 1. POCT – determination of cardiovascular markers ***Seminar:*** 1. Muscle (p. 211) 2. Muscle diseases (p. 218)
12.	**2. REVISION TEST*** **BIOCHEMISTRY NERVOUS TISSUE AND VISION** - Resting/action potential, synapse, synaptic signal transmission - The structure of nervous tissue - The structure of the eye, the chemical composition of individual eye structures - Signal cascade, biochemical processes in light and dark - Glucose metabolism in the vision process	***Hard tissue metabolism*** 1. Determination of ALP in blood serum (patient) 2. Determination of calcium, phosphorus (patient) ***Seminar:*** 1. Metabolism of mineral substances (p. 173) 2. Biochemistry and metabolism of bones (p. 219) 3. Calcium in relation to bone metabolism (p. 223)
13.	**BIOCHEMICAL BASES OF NUTRITION** - Nutrition and biological value of nutrients - Nutrient content requirements, proper nutrition - Impact of food technology and processing on digestion, resorption and utilization of nutrients, food additives - Nutritional problems - obesity	***Clinical biochemistry*** 1. *Patient evaluation:* diagnosis based on biochemical examinations of students **3. REVISION TEST* – practical exercises, seminars** ***Seminar:*** *1. Case reports*
14.	**CLINICAL BIOCHEMISTRY – INTRODUCTION** - Biological material - Biochemical examinations - Factors affecting the results and interpretation of biochemical examination	***Final assessment of practical exercises*** 1. Individual evaluation of student work

** Students can come to see how their test was graded within one week of the test*