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 GIT - General metabolism of AAs - Transport and detoxication of ammonia, Urea cycle - Metabolic transformation of individual AAs	***Metabolism of lipids*** 1. The safety rules in the laboratory 2. Repetition of lipid metabolism, introduction to clinical diagnosis ***Seminar:*** 1. Lipoproteins (p. 92) 2. Significance of lipids in diagnostics (p. 104)
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	***Metabolism of proteins*** 1. Determination of total concentration of proteins (*patient*) ***Seminar:*** 1. Protein digestion (p. 109) 2. Protein metabolism (p. 111)
3.	**METABOLISM OF NUCLEOTIDES** - Synthesis of ribonucleotide and deoxyribonucleotides – synthesis - Degradation of nucleotides - Salvage reaction (recycling reactions) - Regulation of nucleotide synthesis **INTERMEDIARY METABOLISM** - Role of Acetyl-CoA in metabolism - Metabolic interrelation of substrates metabolism - General principles of regulation	***Metabolism of amino acids*** 1. Determination of ammonia 2. Determination of urea in blood serum (patient) ***Seminar:*** 1. Amino acid metabolism (p. 112) 2. Detoxification of ammonia (p. 128)
4.	**BIOCHEMISTRY OF BLOOD** - Erythrocyte metabolism - Tetrapyrrole pigments - Disorders of porphyrin metabolism - Role of blood plasma proteins - Buffers of the blood - Blood clotting as a biochemical process	***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.	**LIVER AND METABOLISM OF FOREIGN COMPOUNDS - XENOBIOCHEMISTRY** - Biochemical function of the liver - Pathobiochemistry of the liver - Xenobiotics – classification and resorption - Biotransformation reactions	***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)
6.	**1. REVISION TEST*** **BIOCHEMISTRY OF KIDNEY, ABB** - Roles of kidney in homeostasis - Metabolic activities of the kidney - Ultrafiltration, reabsorption, secretion - Creatinine, urea, and other markers in the evaluation of kidney - Determination of selected metabolites in urine - Maintenance of acid-base balance (ABB)	***Metabolism of liver*** 1. Determination of ALT in blood serum (patient) 2. Determination of γ-glutamyl transferase activity (patient) ***Seminar:*** 1. Diagnostically important enzymes (p. 27) 2. Liver (p. 195) 3. Metabolism of xenobiotics (p. 200)

7.	**BIOCHEMISTRY OF MUSCLE TISSUE** - Biochemistry of nervous tissue - Resting and action potential, synaptic signal transmission - Neurotransmitters and neuromodulators, receptors - Organization of muscle fibre, muscle proteins - Contraction – relaxation cycle in skeletal, heart, and smooth muscle, regulation of muscle function	***Metabolism of kidney*** 1. Biochemical examination of urine (patient) 2. Determination of creatinine (patient) **Seminar:** 1. Kidney (p. 206) 2. Biochemical tests of kidney functions (p. 208) 3. Clinical-biochemical examinations of urine (p. 239)
8.	**METABOLISM OF HARD TISSUE** - Extracellular matrix - Metabolism of proteins of extracellular matrix (e.g. collagen, elastin, laminin) - Composition and chemistry of bones and teeth - Mineralization and demineralization - Bone remodelling cycle, regulation of bone remodelling - Function and regulation of calcium and phosphorus	***Acid-base balance*** 1. Models of acid-base balance 2. Determination of HCO_3^- ***Seminar:*** 1. Biochemistry of the internal environment (str. 159) 2. Acid-Base balance (p. 165)
9.	**BIOCHEMISTRY NERVOUS TISSUE AND VISION** - The structure of the eye, the chemical composition of individual eye structures - Rhodopsin, opsin and retinal, and retinal isomerization - Signal cascade, biochemical processes in light and dark - Glucose metabolism in the vision process	***Muscle tissue metabolism*** 1. Determination of AST in blood serum (patient) 2. *Case reports:* metabolism of the liver, kidneys ***Seminar:*** 1. Muscle (p. 211) 2. Muscle disease (p. 218)
10.	**CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS** - Signal transduction pathways - Hormones and neurotransmitters - Biochemical structure of hormones - Hormone action - Apoptosis	***Hard tissue metabolism*** 1. Determination of calcium, phosphate (patient) 2. Determination of ALP activity in blood serum (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)
11.	**REPLICATION OF DNA, TRANSCRIPTION** - Organization of genetic material in DNA (genes) - Replication and repair of DNA - Inhibitors of DNA synthesis - Transcriptions and inhibitors of transcription - Biosynthesis of tRNA, mRNA, rRNA - Reverse transcription, HIV virus	***Disorders of gastric secretion/hormonal regulation*** 1. Determination of HCl output by the gastric mucosa 2. *Case reports:* biochemistry of digestion ***Seminar:*** 1. Digestive system (p. 188) 2. Communications in the living system (p. 178)
12.	**2. REVISION TEST*** **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	***Analysis of nucleic acids*** 1. Electrophoretic detection of DNA 2. Restriction enzymes ***Seminar:*** 1. Biochemistry of NAs – replication (p. 142) 2. Transcription (p. 144)
13.	**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	***Clinical biochemistry – introduction*** 1. *Patient evaluation:* diagnosis based on biochemical examinations of students **3. REVISION TEST* – practical exercises, seminars** ***Seminar:*** 1. Translation (p. 146) 2. Evaluation of gene amplification - Covid-19
14.	**BIOCHEMISTRY OF DIGESTION AND NUTRITION** - Digestion of saccharides, lipids, and proteins - role in nutrition - Basic requirements of nutrition - Special nutritional problems (obesity, fasting) - Impact of food technology and processing on digestion, resorption and utilization of nutrients, food additives	***Individual assessment of students' work*** 1. Summary and evaluation of student work

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