

Content of lectures and exercises

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

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 (<i>patient</i>) 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 (<i>patient</i>) 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 (<i>patient</i>) 2. <i>Case reports:</i> 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 (<i>patient</i>) 2. Intermediary metabolism – relationship Seminar: 1. Blood (p. 163) 2. Metabolism of tetrapyrroles (p. 133)
6.	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 (<i>patient</i>) 2. Determination of γ -glutamyl transferase activity (<i>patient</i>) Seminar: 1. Diagnostically important enzymes (p. 27) 2. Liver (p. 195) 3. Metabolism of xenobiotics (p. 200)

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7.	<p>1. REVISION TEST</p> <p>BIOCHEMISTRY OF MUSCLE TISSUE</p> <ul style="list-style-type: none"> - 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 	<p>Metabolism of kidney</p> <ol style="list-style-type: none"> 1. Biochemical examination of urine (patient) 2. Determination of creatinine (patient) <p>Seminar:</p> <ol style="list-style-type: none"> 1. Kidney (p. 206) 2. Biochemical tests of kidney functions (p. 208) 3. Clinical-biochemical examinations of urine (p. 239)
8.	<p>METABOLISM OF HARD TISSUE</p> <ul style="list-style-type: none"> - 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 	<p>Acid-base balance</p> <ol style="list-style-type: none"> 1. Models of acid-base balance 2. Determination of HCO_3^- <p>Seminar:</p> <ol style="list-style-type: none"> 1. Biochemistry of the internal environment (str. 159) 2. Acid-Base balance (p. 165)
9.	<p>BIOCHEMISTRY NERVOUS TISSUE AND VISION</p> <ul style="list-style-type: none"> - 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 	<p>Muscle tissue metabolism</p> <ol style="list-style-type: none"> 1. Determination of AST in blood serum (patient) 2. <i>Case reports:</i> metabolism of the liver, kidneys <p>Seminar:</p> <ol style="list-style-type: none"> 1. Muscle (p. 211) 2. Muscle disease (p. 218)
10.	<p>CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS</p> <ul style="list-style-type: none"> - Signal transduction pathways - Hormones and neurotransmitters - Biochemical structure of hormones - Hormone action - Apoptosis 	<p>Hard tissue metabolism</p> <ol style="list-style-type: none"> 1. Determination of calcium, phosphate (patient) 2. Determination of ALP activity in blood serum (patient) <p>Seminar:</p> <ol style="list-style-type: none"> 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.	<p>REPLICATION OF DNA, TRANSCRIPTION</p> <ul style="list-style-type: none"> - 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 	<p>Disorders of gastric secretion/hormonal regulation</p> <ol style="list-style-type: none"> 1. Determination of HCl output by the gastric mucosa 2. <i>Case reports:</i> biochemistry of digestion <p>Seminar:</p> <ol style="list-style-type: none"> 1. Digestive system (p. 188) 2. Communications in the living system (p. 178)
12.	<p>2. REVISION TEST</p> <p>PROTEOSYNTHESIS</p> <ul style="list-style-type: none"> - 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 	<p>Analysis of nucleic acids</p> <ol style="list-style-type: none"> 1. Electrophoretic detection of DNA 2. Restriction enzymes <p>Seminar:</p> <ol style="list-style-type: none"> 1. Biochemistry of NAs – replication (p. 142) 2. Transcription (p. 144)
13.	<p>REGULATION OF GENE EXPRESSION</p> <ul style="list-style-type: none"> - 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 	<p>Clinical biochemistry – introduction</p> <ol style="list-style-type: none"> 1. <i>Patient evaluation:</i> diagnosis based on biochemical examinations of students <p>REVISION TEST - practical exercises, seminars</p> <p>Seminar:</p> <ol style="list-style-type: none"> 1. Translation (p. 146) 2. Evaluation of gene amplification - Covid-19
14.	<p>BIOCHEMISTRY OF DIGESTION AND NUTRITION</p> <ul style="list-style-type: none"> - 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 	<p>Individual assessment of students' work</p> <ol style="list-style-type: none"> 1. Summary and evaluation of student work