

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. <ul style="list-style-type: none"> - 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 <ol style="list-style-type: none"> 1. The safety rules in laboratory 2. Repetition of lipid metabolism, Introduction to clinical diagnosis Seminar: <ol style="list-style-type: none"> 1. Metabolism of lipoproteins (p.77) 2. Diagnostic significance of lipids
2.	METABOLISM OF AMINO ACIDS II. <ul style="list-style-type: none"> - 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 <ol style="list-style-type: none"> 1. Determination of total concentration of proteins (patient) Seminar: <ol style="list-style-type: none"> 1. Protein digestion (p. 90) 2. Protein metabolism (p. 93)
3.	METABOLISM OF NUCLEOTIDES <ul style="list-style-type: none"> - Synthesis of ribonucleotide and deoxyribonucleotides – synthesis - Degradation of nucleotides - Salvage reaction (recycling reactions) - Regulation of nucleotide synthesis INTERMEDIARY METABOLISM RELATIONSHIPS <ul style="list-style-type: none"> - General principles of regulation - Role of Acetyl-CoA in metabolism - Metabolic interrelation of substrates metabolism 	Metabolism of amino acids <ol style="list-style-type: none"> 1. Determination of ammonia in urine (patient) 2. Determination of urea in blood serum (patient) Seminar: <ol style="list-style-type: none"> 1. Amino acid metabolism (p. 94) 2. Detoxification of ammonia (p. 110)
4.	REPLICATION OF DNA, TRANSCRIPTION <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 	Metabolism of nucleotides <ol style="list-style-type: none"> 1. Determination of uric acid in blood serum (patient) Seminar: <ol style="list-style-type: none"> 1. Metabolism of nucleotides 2. Disorders in metabolism of nitrogen compounds (p.113, 119)
5.	PROTEOSYNTHESIS <ul style="list-style-type: none"> - Translation of mRNA – regulation, inhibition - Cotranslational modification of proteins - Synthesis of secretory and membrane proteins - Posttranslational modifications and control of protein activity - Distribution of the newly synthesized proteins 	Repetition of amino acid and nucleotide metabolism <ol style="list-style-type: none"> 1. Disorders of amino acid metabolism 2. <i>Case reports:</i> disorders of amino acids and nucleotide metabolism Seminar: <ol style="list-style-type: none"> 1. Biochemistry of nucleic acids (p.124-143)
6.	1. REVISION TEST REGULATION OF GENE EXPRESSION <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 	Analysis of nucleic acids <ol style="list-style-type: none"> 1. Electrophoretic detection of DNA Seminar: <ol style="list-style-type: none"> 1. Replication, transcription (p. 124, 127) 2. Proteosynthesis (p. 129)

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7.	BIOCHEMISTRY OF BLOOD <ul style="list-style-type: none"> - Erythrocyte metabolism - Tetrapyrrole pigments - Disorders of porphyrin metabolism - Role of blood plasma proteins - Blood clotting as a biochemical process - Maintenance of acid-base balance (ABB) 	Enzymes in clinical diagnostics 1. Determination of ALP activity in blood serum (patient) Seminar: 1. Enzymes in clinical diagnostics (p. 14) 2. Evaluation of gene amplification - Covid-19
8.	LIVER AND METABOLISM OF FOREIGN COMPOUNDS - XENOBIOCHEMISTRY <ul style="list-style-type: none"> - 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. Hemoglobin and its derivatives Seminar: 1. Blood (p.148) 2. Haemoglobin (p.116)
9.	CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS <ul style="list-style-type: none"> - Signal transduction pathways - Hormones and neurotransmitters - Biochemical structure of hormones - Hormone action - Apoptosis 	Metabolism of liver 1. Determination of ALT in blood serum (patient) 2. Determination of γ -glutamyl transferase activity (patient) Seminar: 1. Liver (p.171) 2. Responses of the liver to toxic damage - Metabolism of xenobiotics (p. 174)
10.	BIOCHEMISTRY OF KIDNEY <ul style="list-style-type: none"> - Roles of kidney in homeostasis - Metabolic activities of kidney - Ultrafiltration, reabsorption, secretion - Creatinine, urea and other markers in evaluation of kidney function - Determination of selected metabolites in urine 	Acid-base balance 1. Determination of HCl output by the gastric mucosa 2. Models of acid-base balance 3. Determination of HCO_3^- Seminar: 1. Biochemistry of inner environment (str. 144) 2. Acid-Base balance (p.150) 3. Digestive system (p. 162)
11.	BIOCHEMISTRY OF NERVOUS AND MUSCLE TISSUE <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 	Metabolism of kidney 1. Biochemical examination of urine (patient) 2. Determination of creatinine (patient) Seminar: 1. Kidney (p.176) 2. Disorders of kidney (p.178) 3. Clinical-biochemical examination of urine (p. 196)
12.	METABOLISM OF HARD TISSUE <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 	Muscle tissue metabolism 1. Determination of AST in blood serum (patient) 2. <i>Case reports:</i> metabolism of the liver, kidneys Seminar: 1. Muscle (p.180) 2. Muscle diseases (p. 187)
13.	2. REVISION TEST BIOCHEMISTRY OF VISION <ul style="list-style-type: none"> - The structure of the eye, the chemical composition of individual eye structures - Rhodopsin, opsin and retinal, retinal isomerization - Signal cascade, biochemical processes in light and dark - Glucose metabolism in the vision process 	Biochemistry of minerals 1. Determination of calcium (patient) 2. <i>Patient evaluation:</i> diagnosis based on biochemical examinations of students Seminar: 1. Metabolism of mineral substances (p. 158) 2. Biochemistry and metabolism of bones (p. 188) 3. Calcium in relation to bone metabolism (p. 192)
14.	BIOCHEMISTRY AND PATHOBIOCHEMISTRY OF DIGESTION AND NUTRITION <ul style="list-style-type: none"> - Digestion of saccharides, lipids, 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. Clinical biochemistry – introduction 2. Summary and evaluation of student work