Subject: **BIOCHEMISTRY 2**
Year of education: **2nd**
Study branch: **Gen. Med.**

2012/13

Summer term
3/3

Week	*Lectures*	*Practical exercises and seminars* http://portal.lf.upjs.sk
1	**METABOLISM OF AMINO ACIDS I.** - Catabolism - degradation of AA - General catabolic processes of AA - NH_3 - formation and urea synthesis - Anabolism - biosynthesis of AA - Intermediates of glycolysis and Krebs cycle and their role in AA metabolism - Metabolic transformation of individual AA *prof. Mareková*	**Lipid metabolism** 1. The safety rules in laboratory 2. Determination of β-lipoproteins in blood serum - 4.3.5 3. Determination of the presence of double bonds in fatty acids Seminar: 1. Repetition of metabolism of lipids *RNDr. Mašlanková*
2	**METABOLISM OF AMINO ACIDS II.** - Biosynthesis of catecholamines - Metabolism of serotonine, thyroxine and creatine - Biosynthesis of tetrapyrroles - Pathobiochemistry of amino acid metabolism **METABOLISM OF NUCLEOTIDES** - Synthesis of ribonucleotide and deoxyribonucleotides - Inhibitors of purine and pyrimidine biosynthesis - relation to the chemotherapy of cancer - Regulation of nucleotide production *prof. Mareková*	**Metabolism of proteins** 1. Determination of total concentration of proteins (*patient*) – 7.4.1 2. Isolation of albumin and globulin of blood serum Seminar: 1. Digestive system 2. Digestion of proteins *RNDr. Mašlanková*
3	**INTERMEDIARY METABOLISM RELATIONSHIPS** - Metabolic interrelation of saccharides, lipids and proteins - Metabolic pathways ***Repetition test from lipids and aminoacids*** *prof. Mareková*	**Metabolism of amino acids I.** 1. Chromatographic determination of disorders in amino acid metabolism 2. Determination of urea in blood serum (*patient*) - 8.1 Seminar: 1. Nitrogen balance 2. Metabolism of proteins 3. Disorders of amino acid metabolism *RNDr. Mašlanková*
4	**NUCLEIC ACIDS AND REPLICATION OF DNA** - Organization of genetic material in DNA (genes) - Replication of DNA in E. coli and in higher animals - Molecular basis of mutations - Methods in molecular biology (gene cloning) **TRANSCRIPTION OF DNA AND PROTEOSYNTHESIS** - Biosynthesis of tRNA, mRNA, rRNA - Molecular mechanism of proteosynthesis, activation of AA - Initiation, elongation and termination of proteosynthesis - Regulation and inhibition of proteosynthesis *RNDr. Mašlanková*	**Metabolism of amino acids II.** 1. Determination of uric acid in blood serum (patient) 2. Determination of ammonia in urine (patient) Seminar: 1. Metabolism of amino acids 2. Detoxication of ammonia - 2.4 *RNDr. Mašlanková*
5	**REGULATION OF GENE EXPRESSION AND GENE ENGINEERING** - The principles of gene expression and regulation - Induction and repression of the transcription - Gene manipulation and therapy - Reverse transcriptase and AIDS virus **MODIFICATION AND SYNTHESIS OF NATIVE PROTEINS** - Folding process - formation of the three dimensional protein molecules - Cotranslation and posttransl. modification of proteins - Distribution of the newly synthesized proteins *RNDr. Mašlanková*	**Nucleic acids I** 1. Isolation of deoxyribonucleoproteins - 5.1 2. Quantitative determination of DNA - 5.2 Seminar: 1. Metabolism of nucleotide - 2.5 2. Methods of DNA isolation 3. Video: Nucleic acids *RNDr. Mašlanková*
6	**BIOCHEMISTRY OF BLOOD** - Specificity of erythrocyte metabolism - Role of blood plasma proteins - Blood clotting as a biochemical process **ACID-BASE BALANCE AND BIOCHEMICAL CONSEQUENCES** - Maintenance of acid-base balance (ABB) - Buffering of pH in organs - Disorders of ABB and their correction mechanism *prof. Mareková*	**Nucleic acids II** 1. Hydrolysis of nucleoprotein or DNA - 5.3 2. Proof of nucleic acid components in their hydrolysate - 5.4.2 Seminar: 1. Biochemistry of nucleic acids 2. Restriction endonucleases – 5.4.1 3. The principle of PCR reaction – 5.4.4 *RNDr. Mašlanková*

7	**CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS** - Chemical compounds as signal molecules - Regulation of the metabolism on cellular level - The role of adenylate cyclase - The G-proteins and their relation to the cAMP - Role of phosphatidylinositolbisphosphate in the signal transduction and role of calmoduline and NO ***Repetition test from metabol. of nucleic acid (3-6 week)*** *doc. Tomečková*	**Biochemistry of blood** 1. Determination of bilirubin in blood serum - 7.2.1 (*patient*) 2. Hemoglobin and its derivates Seminar: 1. Biochemistry of internal environment 2. Blood 3. Metabolism of tetrapyrolls 4. Video: Hemoglobin I, II. III. *RNDr. Mašlanková*
8	**LIVER AND METABOLISM OF FOREIGN COMPOUNDS - XENOBIOCHEMISTRY** - Biochemical function of the liver - Pathobiochemistry of the liver - Xenobiotics - classification - Resorption and binding of xenobiotics - Review of metabolism of foreign compounds - Biotransformation reactions *prof. Mareková*	**Acid-base balance** 1. Models of acid-base balance - 7.3.1 2. Determination of HCO_3^- - 7.3.2 Seminar: 1. Acid-Base balance *RNDr. Mašlanková*
9	**METABOLISM OF KIDNEY** - Roles of kidney in homeostasis - Metabolic activities of kidney - Endocrinal functions of kidney **ACID BASE BALANCE** - Roles of buffer, lungs, kidney, liver - Disorders of acid base balance *RNDr. Mašlanková*	**Metabolism of liver** 1. Determination of γ-glutamyl transferase activity - 7.5.22 (*patient*) 2. Determination of ALT in blood serum - 7.1.2 (*patient*) Seminar: 1. Liver – 5.2 *RNDr. Mašlanková*
10	**METABOLISM OF MINERALS AND TRACE ELEMENTS** - Inorganic compounds in the organism, function - Water balance - Metabolism of Fe, Cu, Zn, Mn, Co and Se **METABOLISM OF HARD TISSUE** - Composition and chemistry of bones and teeth - Mineralization and demineralisation *RNDr. Stupák*	**Metabolism of kidney** 1. Biochemical examination of urine *(patient)* – 8.2 - 8.4 2. Determination of creatinine - 7.1.1 *(patient)* Seminar: 1. Kidney – 5.3 2. Clinical-biochem.analysis of urine *RNDr. Mašlanková*
11	**SPECIAL METABOLIC PROCESSES** - Special features of CNS metabolism - Neurotransmitters and neuromodulators - Neurotransmissions and its regulation - Biochemistry of vision - Central nervous system disorders *Mgr. Urban*	**Biochemistry of minerals** 1. Determination of calcium (instruction) 2. Determination of inorg. phosphorus – 7.3.3. Seminar: 1. Metabolism of minerals 2. Calcium in relation to bone metabolism *RNDr. Mašlanková*
12	**SPECIAL METABOLIC PROCESSES** - Metabolism of connective tissues - Biochemistry of the skin and muscles - Biochemistry of heart *RNDr. Mašlanková*	**Special metabolic processes** 1. Determination of HCl output by the gastric mucosa - 6.1. Seminar: 1. Importance of HCl in the stomach *RNDr. Mašlanková*
13	**BIOCHEMISTRY AND PATHOBIOCHEMISTRY OF DIGESTION AND NUTRITION** - Digestion of saccharides, lipids, proteins and nucleoproteins and their role in nutrition - Basic requirements of nutrition - Special nutritional problems (obesity, fasting) - Pathobiochemistry of nutritional disorders ***Repetition test from special metab. processes (week 7-12)*** *prof. Mareková*	**Biochemistry of muscles and bones** 1. Determination of AST activity (patient) 2. Determination of ALP activity (patient) Seminar: 1. Metabolism of muscle 2. Metabolism of bones *RNDr. Mašlanková*
14	**CLINICAL BIOCHEMISTRY** - Role and position in medicine *doc. Tomečková*	**Final exercise** 1. Diagnosis and its relationship to the biochemical examination – student seminar work 2. Summary and evaluation of student work