**BIOLOGICAL CHEMISTRY LECTURE CALENDAR FOR 2020-2021 ACADEMIC YEAR FOR PEDIATRIC, MEDICAL-PEDAGOGICAL AND MEDICAL FACULTIES**

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| **No** | **Date** | **Lecture content** |
| **3 SEMESTER** |
| 1 |  | **INTRODUCTION TO BIOLOGICAL CHEMISTRY.** **INTRODUCTION TO METABOLISM, FOOD BIOCHEMISTRY AND TRANSPORT OF SUBSTANCES THROUGH MEMBRANES - 2 h.****Introduction to Biological Chemistry****-** Subject and tasks of biochemistry.- The main sections of biochemistry, its directions, importance in medicine, clinical biochemistry.**Introduction to metabolism, nutritional biochemistry and transport of substances across membranes****-** Metabolism is nutrition, metabolism and excretion of metabolic end products.- Composition of human food: major and minor components.- Metabolism, the concept of metabolic pathways.- Methods for studying metabolism.- Biological membranes, transmembrane transport of substances. |
| 2 |  | **BIOLOGICAL OXIDATION - 2h.****Biological oxidation.****-** General concept of biological oxidation.- Enzymes of biological oxidation.- Electron transport chain.- Phosphorylation of ADP (substrate and oxidative phosphorylation). |
| 3 |  | **GENERAL WAYS OF CATABOLISM - 2h.****Common pathways of catabolism.****-** Scheme and stages of the general path of catabolism.- Composition of the pyruvate dehydrogenase multienzyme complex.- Oxidative decarboxylation of pyruvate and formation of acetyl-CoA.- The citric acid cycle, its functions, regulation, connection with the respiratory chain.. |
| 4 |  | **EXCHANGE OF CARBOHYDRATES - 2h.****Ways of using glucose in the body. Glycogen exchange.**- Absorption of carbohydrates. Ways of using the absorbed carbohydrates in the body.- Synthesis and breakdown of glycogen and its regulation. Action of glucokinases and hexokinases.- Glucose catabolism. Aerobic glycolysis is the main pathway for glucose catabolism. |
| 5 |  | **EXCHANGE OF CARBOHYDRATES (continued) - 2h.** **Exchange of hexoses. Pentose phosphate pathway of glucose breakdown. Glycosaminoglycans, proteoglycans.****-** Gluconeogenesis. The pathway for the formation of glucose from lactic acid. Measles and glucose-alanine cycles. Key enzymes of glycolysis and gluconeogenesis and their regulation.- Pentose phosphate pathway of glucose oxidation and its significance.- Glycoproteins and proteoglycans, structure of function. |
| 6 |  | **EXCHANGE OF LIPIDS, THEIR FUNCTIONS AND METABOLISM - 2h.**- Resynthesis of fats in the intestinal wall.- Formation of chylomicrons and transport of lipids.- Lipoproteins, lipoprotein lipase enzyme value.- Reservation and mobilization of lipids in fat stores. |
| 7 |  | **EXCHANGE OF LIPIDS, THEIR FUNCTIONS AND METABOLISM (continued) - 2h.**- Cascade mechanism of triglyceride lipase activation.- Biosynthesis of fatty acids and its regulation.- Basic phospholipids, glycolipids and their functions.- Biosynthesis of phospholipids and their catabolism. |
| 8 |  | **EXCHANGE OF SIMPLE PROTEINS - 2h.**- The dynamic state of proteins in the body. Cathepsins- The biological significance of proteins. Protein stores.- Digestion of proteins. Substrate specificity of proteases.- Absorption of amino acids.- Biochemical basis of diseases of the gastrointestinal tract.- Parenteral nutrition. The main sources of ammonia in the body.- End products of nitrogen metabolism: ammonium salts and urea. |
| 9. |  | **EXCHANGE OF SIMPLE PROTEINS (continued) - 2h.****-** Synthesis of urea and violations of its excretion.- Metabolic pathways of amino acids: deamination, transamination: aminotransferases, coenzyme function of vitamin B6.- Decarboxylation of amino acids. Biogenic amines: pathways and functions of histamine, serotonin, aminobutyric acid, catecholamines. |
| **4 SEMESTER** |
| 1 |  | **EXCHANGE OF NUCLEOPROTHEIDS - 2h**- Digestion and absorption of nucleoproteins.- Decay of purine nucleotides.- Synthesis of purine nucleotides, sources of atoms of the purine nucleus; the initial stages of biosynthesis (from ribose-5-phosphate to 5-phosphoribosylamine).- Inosinic acid - as a precursor of adenylic and guanylic acids.- Biosynthesis and decay of pyrimidine nucleotides. Biosynthesis of uridylic acid. Synthesis of cytidyl nucleotides.- Biosynthesis of deoxyribonucleotides. Synthesis of thymidyl nucleotides.- Coordination and disruption of the biosynthesis of purine and pyrimidine nucleotides (hyperuricemia and orotociduria). |
| 2 |  | **HORMONAL REGULATION OF EXCHANGE OF SUBSTANCES AND FUNCTIONS - 2h****-** General aspects of regulation and the hierarchy of regulatory systems.- Classification of hormones by chemical nature, biological function and mechanism of action.- The relationship of the endocrine and nervous systems. The hypothalamic-pituitary system and their effect on other endocrine glands (liberins, statins and tropic hormones).- Thyroid hormones.- Regulation of the metabolism of carbohydrates, lipids and amino acids. -Regulation of the input-salt metabolism.- Regulation of calcium phosphate metabolism.- Local hormones. |
| 3 |  | **MOLECULAR BIOLOGY - I - 2h****Gene expression: replication, transcription.**- DNA and heredity, DNA biosynthesis (replication)- Replication is a way of transferring genetic information.- RNA biosynthesis (transcription). Transcription as a way of forming DNA information in the form of RNA.- Maturation of RNA after transcription. |
| 4 |  | **MOLECULAR BIOLOGY - II -2h****Gene expression: protein biosynthesis****-** The genetic code, its composition. The significance of the experiments of Nirenberg va Mattei in decoding the genetic code. The main components of the protein synthesizing system (translation).- Stages of protein synthesis. - Post-translational modification of the polypeptide chain.- Regulation of genes. The concept of an operon.- Regulation of protein biosynthesis. Inhibitors of matrix biosynthesis (antibiotics, interferons, toxins). |
| 5 |  | **MOLECULAR BIOLOGY - III -2h****Cell biology. Mechanisms of genetic variation.****-** Mechanisms of genetic variability. Protein polymorphism.- Fundamentals of apoptosis.- Hereditary diseases. Use of DNA technologies in medicine.- DNA analysis: sequencing, restriction analysis, PCR amplification, hybridization.- DNA damage and repair. - Molecular mutations: exchange, deletion, insertion of nucleotides.- Basics of oncogenesis. The theory of multistage carcinogenesis.- Physical, chemical and biological factors causing the development of cancer.- Specific properties of a cancer cell.- Analysis and basic principles of cancer treatment. |
| 6 |  | **BLOOD BIOCHEMISTRY - 2h**- The main functions of blood, the chemical composition of blood.- Plasma proteins and their functions.- Erythrocytes and hemoglobin. Hemoglobin synthesis and regulation.- Metabolism of erythrocytes.- Coagulation and anticoagulation system of the blood.- Anemia, porphyria and hemophilia. |
| 7 |  | **LIVER BIOCHEMISTRY - 2h**- Microsomal oxidation and conjugation reactions in the liver.- Neutralization of normal metabolites and other substances in the liver.- Heme catabolism, yellowness and its varieties, hormone inactivation.- The role of the liver in the metabolism of carbohydrates, lipids, amino acids. |
| 8 |  | **BIOCHEMISTRY OF CONNECTIVE TISSUE - 2h**- Features of the amino acid composition of collagen, primary and spatial structure, biosynthesis. The role of ascorbic acid in the hydroxylation of lysine and proline. Signs of vitamin C deficiency.- Biological functions of glycosaminoglycans and proteoglycans (supporting, protective, mechanical, binding, regulation).- Oxyprolinuria for collagen diseases. |
| 9 |  | **MUSCLE BIOCHEMISTRY - 2h****-** Basic proteins of myofibrils (myosin, actin, actomyosin, tropomyosin, troponin), their molecular structure.- Molecular structure of myofibrils. Biochemical mechanisms of muscle contraction and relaxation.- The mechanism of smooth muscle contraction.- Sarcoplasmic proteins: myoglobin, structure and function.- Extractive substances of muscles. Features of energy metabolism in muscles: creatine phosphate.- Muscle dystrophy and biochemical changes in denervation.- Normal metabolic, physiological and regulatory processes in the heart muscle, metabolism in it, biochemical and secretory functions (for example, atrial natriuretic peptides). |

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