**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). |

**Head of the Department, Professor Yuldashev N.M.**