

**Thematic plan of seminars
in the discipline "Biochemistry"
for students of the educational program specialist degree
in the specialty of training 31.05.01 General medicine,
direction (profile) General medicine,
form of study full - time
for the 2023-2024 academic year**

№	Thematic blocks	Hours (academic)
1.	Introduction to biological chemistry. Structural organization of proteins. Levels of structural organization. Determination of the amount of protein in the solution.	2
	Colorimetric biuretic method. Electrophoresis of serum proteins (demonstration).	1
2.	Interaction of protein with ligands. The relationship between the structure and functions of proteins. Active centers. Domain organization of proteins. Features of the functioning of oligomeric proteins. Protein polymorphism. Interaction of protein with ligands.	2
	The structure of collagen, immunoglobulins and hemoglobin.	1
3	Enzymes. Biological role. Mechanism and features of enzymatic catalysis. Cofactors and coenzymes.	2
	Determination of amylase activity.	1
4	Kinetics of enzymatic reactions. Principles of determining the activity of enzymes. Medical enzymology (enzyme diagnostics, enzyme therapy, enzymes in biotechnology). Kinetics of enzymatic reactions.	2
	Detection of urease activity and determination of specificity. Thermolability of enzymes on the example of saliva amylase. Effect of pH on saliva amylase activity. Quantitative determination of diastase (amylase) in urine.	1
5	Regulation of enzyme activity as a molecular basis for the regulation of metabolism. Regulation of intracellular metabolism by external signals. Inhibition of enzyme activity. Regulation of enzyme activity as a molecular basis for the regulation of metabolism.	2
	The effect of activators and inhibitors on the activity of saliva amylase.	1
6	Energy metabolism: ways of ATP formation. Tissue respiration and oxidative phosphorylation. Structural organization of the respiratory chain.	2
	Inhibitors of electron transport chain. Uncouplers of oxidation and phosphorylation.	1
7	The common metabolic pathways. Specific and common pathways of catabolism. Oxidative decarboxylation of pyruvic acid. Regulation of PDH complex.	2
	Tricarboxylic acid cycle.	1
8	Structure, classification and biological role of carbohydrates.	2
	Detection of lactose in milk. Detection of starch in bread. Quantitative determination of glucose by the glucooxidase method. Glucose tolerance test.	1

9	Glucose catabolism. Anaerobic and aerobic oxidation of glucose. Glucose anabolism. Gluconeogenesis.	2
	Alcoholic fermentation. Detection of alcoholic fermentation products.	1
10	The pentose phosphate pathway. Regulation of carbohydrate metabolism.	2
	Disorders of carbohydrate metabolism.	1
11	COLLOQUIUM: Bioenergetics of the cell. Common catabolic pathway. Chemistry and metabolism of carbohydrates.	2
12	Chemistry of lipids. Digestion and absorption of lipids. Lipoproteins. Lecithin hydrolysis and detection of hydrolysis products.	2
13	Lipid metabolism 1. Fatty acids catabolism, its stages. Energy yield. Oxidation of glycerol. Biosynthesis of fatty acids. Determination of total lipids in blood serum by color reaction with sulfophosphovanil reagent.	2
14	Lipid metabolism 2. Ketone bodies. Structure and biological role. Cholesterol biosynthesis, its stages. Detection of ketone bodies in urine. Determination of total cholesterol concentration in blood serum by enzymatic colorimetric method.	2
15	COLLOQUIUM: chemistry and metabolism of lipids.	2
	Intermediate certification	
16	Common pathways of amino acid metabolism. Digestion of proteins and absorption of digestion products. Deamination. Disposal of ammonia in the human body.	2
17	Common pathways of amino acid metabolism. Decarboxylation of amino acids. Biogenic amines, their biological role. Metabolism of phenylalanine and tyrosine. Hereditary and acquired metabolic disorders of amino acids and biogenic amines. Detection of phenylpyruvic acid in urine. Quantitative determination of urea in blood serum.	2
18	Metabolism of heme and iron. Disorders of their metabolism. Determination of total bilirubin in blood serum. Determination of “direct” bilirubin in blood serum. Spectral analysis of hemoglobin and its derivatives. Production of hydrochloral heme crystals.	2
19	Toxic substances and the mechanism of their neutralization. Protective enzyme systems. Quantitative determination of blood catalase. Detection of the action of peroxidase.	2
20	COLLOQUIUM: metabolism of simple and complex proteins. Toxic substances and the mechanism of their neutralization.	2
21	Synthesis and degradation of purine and pyrimidine nucleotides. Structure and functions of nucleic acids. Quantitative determination of uric acid in blood serum.	2
22	Nucleoproteins. DNA biosynthesis (replication and repair). Hydrolysis of yeast DNP and detection of DNP components in the hydrolysate.	2
23	Genes and genome. Transcription. Post-translational modification of RNA (processing). Regulation of gene expression.	2

24	Biosynthesis of proteins (translation). Posttranslational modification of proteins. Regulation of lifetime and proteolysis of intracellular proteins.	2
25	COLLOQUIUM: Biosynthesis of nucleic acids and proteins. Regulation of biosynthesis.	2
26	Biochemical integration of the body. Intercellular communication. Endocrine system. Hormonal heirarchy relationships. Mechanism of signal reception and transduction.	2
27	Biochemical mechanisms of synthesis, action and breakdown of hormones. Detection of adrenaline and insulin.	2
28	Blood biochemistry (including the principles of biochemical diagnostics and interpretation of the results of biochemical tests). Detection of Glucose 6-phosphate dehydrogenase (G6PD). Determination of aminotransferases activity in blood serum.	2
29	COLLOQUIUM: Biochemical integration of the body. The endocrine system. Blood biochemistry.	2
30	Biochemistry of connective tissue and intercellular matrix. Hydrolysis of umbilical cord proteoglycans and detection of hydrolysis products.	2
31	Biochemistry of muscles. Muscle proteins. Major biochemical events occurring during a cycle of muscle contraction and relaxation Biochemistry of nervous tissue. Biochemistry of the origin and conduction of the nerve impulse. Molecular mechanisms of synaptic transmission.	2
32	Nutrition and energy supply. Basal metabolic rate. Nutritional importance of carbohydrates, lipids, proteins. Essential components. Requirements of carbohydrates, lipids, proteins. Nutritional importance of vitamins and minerals. Balanced diet.	2
	Intermediate certification	exam
	Total	74

¹ -Subject

² - essential content (if necessary)

Considered at the meeting of the department of Theoretical biochemistry with a course of clinical biochemistry "10" May 2023, protocol № 16

Head of the Department

O.V. Ostrovskij.