

**Thematic plan of seminar-type classes
in discipline «Biochemistry»
for students of 2024 year of admission
under the educational programme
31.05.01 General medicine,
specialisation (profile) General medicine
(Specialist's degree),
form of study - full-time
for the 2025-2026 academic year**

№	Thematic blocks	Hours (academic)
1.	Introduction to biological chemistry. Structural organization of proteins. ¹ Levels of structural organization. Determination of the amount of protein in the solution. Colorimetric biuretic method. Electrophoresis of serum proteins (demonstration). ²	2
2	Structural organization and physico-chemical properties of proteins.	2
3.	Interaction of protein with ligands. ¹ 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. The structure of collagen, immunoglobulins and hemoglobin. ²	2
4	Enzymes. Biological role. ¹ Mechanism and features of enzymatic catalysis. Cofactors and coenzymes. Determination of amylase activity. ²	2
5	Kinetics of enzymatic reactions. ¹ Principles of determining the activity of enzymes. Medical enzymology (enzyme diagnostics, enzyme therapy, enzymes in biotechnology). Kinetics of enzymatic reactions. 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. ²	2
6	Regulation of enzyme activity as a molecular basis for the regulation of metabolism. ¹ Regulation of intracellular metabolism by external signals. Inhibition of enzyme activity. Regulation of enzyme activity as a molecular basis for the regulation of metabolism. The effect of activators and inhibitors on the activity of saliva amylase. ²	2
7	Control of knowledge, skills and abilities according to modular unit 1 (intermediate control): proteins and enzymes.	2
8	Energy metabolism: ways of ATP formation. ¹ Tissue respiration and oxidative phosphorylation. Structural organization of the respiratory chain. Inhibitors of electron transport chain. Uncouplers of oxidation and phosphorylation.	2
9	The common catabolic pathways. ¹ Specific and common pathways of catabolism. Oxidative decarboxylation of pyruvic acid. Regulation of PDH complex. Tricarboxylic acid cycle. ²	2

10	Structure, classification and biological role of carbohydrates. ¹ Detection of lactose in milk. Detection of starch in bread. Quantitative determination of glucose by the glucooxidase method. Glucose tolerance test. ²	2
11	Glucose metabolism. ¹ Anaerobic and aerobic oxidation of glucose. Gluconeogenesis. Alcoholic fermentation. Detection of alcoholic fermentation products. ²	2
12	The pentose phosphate pathway. Regulation of carbohydrate metabolism. Disorders of carbohydrate metabolism.	2
13	Control of knowledge, skills and abilities in modular unit 2 (intermediate control): energy metabolism, a common pathway of catabolism. Chemistry and metabolism of carbohydrates.	2
14	Chemistry of lipids. ¹ Digestion and absorption of lipids. Lipoproteins. Lecithin hydrolysis and detection of hydrolysis products. ²	2
15	Mobilization of fats. Oxidation of fatty acids. Energy yield. Oxidation of glycerol. Ketone bodies. ¹ Determination of total lipids in blood serum by color reaction with sulfophosphovaniline reagent. Detection of ketone bodies in urine. ²	2
16	Synthesis of fatty acids and triacylglycerols. Obesity.	2
17	The cholesterol biosynthesis. ¹ Lipoproteins. Atherosclerosis. Determination of total cholesterol concentration in blood serum by enzymatic colorimetric method. ²	2
18	Biological membranes. ¹ Structure, properties and bioroll. Mechanisms of transfer of substances through membranes, mechanisms of transmission of hormonal signals. ²	2
19	Control of knowledge, skills and abilities in modular unit 3 (intermediate control): lipid chemistry, lipid metabolism, membrane structure and functions.	2
20	Biochemistry of nutrition. Vitamins. Macro- and microelements. ¹ Vitamins. Classification, nomenclature. Provitamins. Hypo-, hyper- and vitamin deficiency, causes of occurrence. Vitamin-dependent and vitamin-resistant conditions. Water-soluble vitamins, their biological role. Fat-soluble vitamins, their biological role.	2
third semester		
21	Digestion of proteins and absorption of digestion products. Common pathways of amino acid metabolism. ¹ Deamination. Disposal of ammonia in the human body. ²	2
22	Common pathways of amino acid metabolism. ¹ 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	2
23	Metabolism of heme and iron. Disorders of their metabolism. ¹ Determination of total bilirubin in blood serum. Determination of "direct" bilirubin in blood serum. Spectral analysis of hemoglobin and its derivatives. Production of hydrochloral hemine crystals. ²	2
24	Toxic substances and the mechanism of their neutralization. ¹ Protective enzyme systems. Quantitative determination of blood catalase. Detection of the action of peroxidase. ²	2
25	Control of knowledge, skills and abilities according to modular unit 4 (intermediate control): The exchange of simple and complex proteins.	2

	Protective enzyme systems of the body.	
26	Synthesis and degradation of purine and pyrimidine nucleotides. ¹ Structure and functions of nucleic acids. Quantitative determination of uric acid in blood serum. ²	2
27	Nucleoproteins. DNA biosynthesis (replication and repair). ¹ Hydrolysis of yeast DNP and detection of DNP components in the hydrolysate.	2
28	Genes and genome. Transcription. ¹ Posttranscriptional modification of RNA (processing). Regulation of gene expression. ²	2
29	Biosynthesis of proteins (translation). Posttranslational modification of proteins. Regulation of lifetime and proteolysis of intracellular proteins.	2
30	Control of knowledge, skills and abilities according to modular unit 5 (intermediate control): biosynthesis of nucleic acids and proteins. Regulation of biosynthesis.	2
31	Biochemical integration of the organism. Intercellular communication. ¹ Endocrine system. Hormonal hierarchy relationships. Mechanism of signal reception and transduction. ²	2
32	Biochemical mechanisms of synthesis, action and breakdown of hormones. ¹ Detection of adrenaline and insulin. ²	2
33	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
34	Control of knowledge, skills and abilities according to modular unit 6 (intermediate control): Biochemical integration of the body. The hormonal system. Blood biochemistry.	2
35	Biochemistry of connective tissue and intercellular matrix. ¹ Hydrolysis of umbilical cord proteoglycans and detection of hydrolysis products. ²	2
36	Biochemistry of muscles. Muscle proteins. ¹ Major biochemical events occurring during a cycle of muscle contraction and relaxation. ² Biochemistry of nervous tissue. ¹ Biochemistry of the origin and conduction of the nerve impulse. Molecular mechanisms of synaptic transmission. ²	2
	Total	72

¹ – topic

² – essential content

³ – one thematic block includes several classes, the duration of one class is 45 minutes, with a break between classes of at least 5 minutes

Considered at the department meeting fundamental and clinical biochemistry, protocol of «29» may 2025 y., № 12.

Head of the Department of Basic
and Clinical Biochemistry

O.V. Ostrovskij.