

**Academic programme
component**

**31.05.01 General Medicine
programme**

**Б1.0.15 Biochemistry
discipline code**

ASSESSMENT MATERIALS

Discipline Б1.0. 15 Biochemistry

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Record no. _____ dated

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1. Criteria and assessment of competencies and their mastery indicators, formed by the discipline

Code and competence name	Code and indicator of competence mastery	Results of training in the discipline (module)			Formative assessment	Interim assessment
		<i>To know</i>	<i>To be able to</i>	<i>To have</i>		
УК-1 Can design action plans and apply systematic approach to critical analysis of problem situations	ИД-1УК-1 Applies a systematic approach in search and analytical activities to solve the tasks set	<ul style="list-style-type: none"> - the chemical and biological essence of the processes occurring in a living organism at the molecular and cellular levels; - the structure and properties of the main classes of biologically important compounds, the main ways of their transformation, the role of cell membranes and transport systems in metabolism in the body; - basic biochemical constants and their variability in pathological processes. 	<ul style="list-style-type: none"> - interpret the results of biochemical studies; - to determine the pathological condition based on laboratory analysis data, to explain the mechanism of action of drugs and other substances on the human body; - interpret the results of the most common methods of laboratory and functional diagnostics. 	<ul style="list-style-type: none"> - skills in applying biochemical methods for examination of the patient. - skills in decoding laboratory analysis. - information about changes in biochemical parameters, taking into account the laws of the course of pathological processes. 	<ul style="list-style-type: none"> - a set of tasks for practical work; - test tasks; - colloquium topics 	Formative assessment results Examination
ОПК-5 Can analyze morphofunctional and physiological indicators as well as pathological processes in human body to achieve professional goals	ОПК-5.2. Defines and analyzes morphological, functional, physiological states and pathological processes of the human body based on knowledge of biomolecules, subcellular cultures, their biochemical characteristics, metabolic pathways and principles of regulation					

2. Competencies mastery (indicators of their mastery) level assessment

Competencies mastery (their indicators) indices	Criteria and grading system of competencies mastery (indicators of their mastery) assessment			
	Insufficient («unsatisfactory»)	Sufficient («satisfactory»)	Above average («good»)	Advance («excellent»)
Extent of knowledge	Knowledge level is below the required. Major mistakes occurred.	Minimally allowed knowledge level. Minor mistakes occurred.	Knowledge level corresponds well to the educational programme. Minor errors occurred.	Knowledge level corresponds well to the educational programme.
Ability mastery	Basic abilities were not demonstrated during standard tasks completion. Major mistakes occurred.	Basic abilities were demonstrated. All tasks were completed, yet not in full (clarifications are absent, conclusions are incomplete)	All main abilities were demonstrated. All tasks were completed in full, yet with few errors.	All main abilities were demonstrated. All main and additional tasks were completed without mistakes or errors.
Skill mastery (having experience)	Basic skills were not demonstrated during standard tasks completion. Major mistakes occurred	Minimum set of skills for standard tasks completion with minor error, is acquired.	Basic skills were demonstrated in completing standard tasks, yet with few errors.	All main skills were demonstrated in completing main and additional tasks without mistakes or errors.
Competence mastery characteristics	Competencies have not been acquired. The acquired knowledge, skills, and abilities are not enough to solve practical (professional) tasks. OR Insufficient number of credit points as per the established range.	Competencies mastery is adequate. The acquired knowledge, abilities, and skills are mostly sufficient to complete professional tasks.	Competencies mastery mainly satisfies the requirements. The acquired knowledge, abilities, and skills are mainly sufficient to complete professional tasks.	Competencies mastery satisfies the requirements to the full extent. The acquired knowledge, abilities, and skills are fully sufficient to complete difficult professional tasks, including non-standard.

3. Criteria and grading system of the formative assessment tasks

3.1 Criteria and grading system of laboratory work

The list of laboratory works, order of completion and presentation, requirements for results, structure, and contents of laboratory work report, etc., are presented in the methodological guidelines on mastering the discipline as well as in MAU LMS Moodle.

Grade/points	Assessment criteria
<i>Excellent</i>	The task is completed correctly and in full. The laboratory report is well-prepared and satisfies the requirements. Answers to the teacher's questions (during the presentation) are full.
<i>Good</i>	The task is completed in full, yet without sufficient justification or a minor error, which does not impact the argumentation sequence, occurred. All task completion requirements are satisfied.
<i>Satisfactory</i>	The task is completed partially, with mistakes. Adequate level of completed laboratory or practical tasks. Majority of task completion requirements are satisfied.
<i>Unsatisfactory</i>	The task has not been completed.

3.2 Criteria and grading system of tests

The list of test questions and tasks, as well as test procedure description are presented in the methodological guidelines on mastering the discipline, as well as in MAU LMS Moodle.

Assessment materials include a typical test variant:

1. What is the name of the substance with which the enzyme interacts?
 - a) apoenzyme;
 - b) coenzyme;
 - c) isoenzyme;
 - d) substrate;**
 - e) holoenzyme.
2. Which enzyme, which is part of saliva, has an antibacterial effect?
 - a) amylase;
 - b) lysozyme;**
 - c) maltase;
 - d) trypsin;
 - e) sucrose.
3. Coenzyme is:
 - a) the protein part of a complex enzyme;
 - b) the non-protein part of a complex enzyme that is strongly associated with the apoenzyme;
 - c) the non-protein part of a simple enzyme;
 - d) the non-protein part of a complex enzyme that is loosely bound to the apoenzyme.**
4. The enzyme exhibits absolute specificity to the substrate:
 - a) pepsin;
 - b) chymotrypsin;
 - c) urease;**
 - d) lipase.
5. Which enzyme is classified as glycosidase?

- a) cholesterol;
 - b) amylase;**
 - c) trypsin;
 - d) phospholipase.
6. What is the difference between enzymes and inorganic catalysts:
- a) they do not change the direction of the reaction;
 - b) do not shift the equilibrium towards a direct or reverse reaction;
 - c) have a high specificity of action;**
 - d) are not consumed during the reaction process.
7. The greatest activity of ALT is found in:
- a) lungs;
 - b) liver;**
 - c) skeletal muscles;
 - d) kidneys;
 - e) the pancreas.
8. With this type of inhibition, the inhibitor binds to the active center of the enzyme and prevents the formation of an enzyme-substrate complex:
- a) reversible;
 - b) irreversible;
 - c) competitive;**
 - d) uncompetitive.
9. Which enzymes catalyze the breaking of C–O, C–C, C–N bonds and reversible reactions of cleavage of various groups from substrates in a non-hydrolytic way?
- a) oxidoreductases;
 - b) ligases;
 - c) hydrolases;
 - d) transferases;
 - e) lyases;**
 - f) isomerases.
10. The Michaelis constant is the concentration of the substrate at which the reaction rate
- a) is minimal;
 - b) equal to half of the maximum;**
 - c) is the maximum.
11. What is the relative specificity of an enzyme?
- a) the ability of an enzyme to catalyze the transformation of several substrates having the same type of bond;**
 - b) the ability of the enzyme to catalyze the conversion of only one stereoisomer;
 - c) the ability of the enzyme to catalyze the transformation of only one substrate.
12. The content of LDH1 and LDH2 isoenzymes is highest in:
- a) the heart;**
 - b) skeletal muscles;
 - c) liver;
 - d) tumor cells;
 - e) the pancreas.
13. What is the name of the enzyme center where the substrate is attached?
- a) allosteric;
 - b) catalytic;
 - c) active.**
14. What class of enzymes do dehydrogenases belong to?
- a) transferases;
 - b) ligases;
 - c) hydrolases;

d) oxidoreductases;

e) lyases;

f) Isomerases.

15. Which enzyme controls starch hydrolysis?

a) trypsin;

b) lipase;

c) phospholipase;

d) amylase;

e) cholesterol.

16. What are proenzymes?

a) denatured enzymes;

b) inactive enzyme precursors;

c) fragments of enzyme molecules;

d) non-protein components.

17. Which compounds are lipase activators?

a) amino acids;

b) bile acids;

c) phospholipase;

d) trypsin;

e) enterokinase.

18. Enzymes that catalyze the transfer reactions of groups of atoms from a molecule of one substance to a molecule of another:

a) ligases;

b) lyases;

c) transferases;

d) hydrolases;

e) isomerases;

f) Oxidoreductases.

19. Transcription enzyme:

1) DNA polymerase;

2) DNA helicase;

3) RNA polymerase;

4) DNA topoisomerase.

20. Proteases catalyze the cleavage of:

a) ester bonds;

b) glycoside bonds;

c) peptide bonds.

Grade/points	Assessment criteria
<i>Excellent</i>	90-100% of correct answers
<i>Good</i>	70-89% of correct answers
<i>Satisfactory</i>	50-69% of correct answers
<i>Unsatisfactory</i>	49% or less of correct answers

3.3. Criteria and grading system of colloquiums

The recommendations for colloquium preparation are presented in the methodological guidelines on mastering the discipline, as well as in MAU LMS Moodle.

Assessment materials include typical colloquium topics:

1. Enzymes (definition). The structure of enzymes, the active center. Simple and complex enzymes. Apoenzyme. The cofactor.
2. General properties and differences of enzymes and inorganic catalyts.
3. Localization of enzymes in cells and tissues (general, organospecific and organellospecific enzymes).
4. Mechanisms of action of enzymes (theories of E. Fischer, D. Koshland).
5. The main stages of enzymatic catalysis (3 stages).
6. The specificity of the action of enzymes (tell us about the absolute and relative specificity, give examples).
7. Dependence of the rate of enzymatic reaction on the concentration of the substrate. The Michaelis–Menten equation.
8. Dependence of the rate of the enzymatic reaction on the concentration of the enzyme (graph).
9. Dependence of the rate of the enzymatic reaction on the temperature of the medium (temperature optimum).
10. Dependence of the rate of enzymatic reaction on the pH of the medium (optimum pH).
11. Regulation of enzyme activity (specific, non-specific).
12. The role of hormones and secondary messengers in the regulation of enzyme activity.
13. Classification of enzymes (tell us about 6 classes of enzymes).
14. Basic principles of enzyme diagnostics. Enzymodiagnosics of heart and liver diseases (the activity of which enzymes increases in the blood).

Grade	Assessment criteria
<i>Excellent</i>	A complete, detailed answer to the question(s) posed. Student uses terminology fluently. Deep understanding of the programme material, as well as consistent, competent answers. Fluency in the material, correct justification of the decisions made.
<i>Good</i>	A complete, detailed answer to the question(s) posed. Clear structure and logical sequence in the answer. Understanding of the programme material, its competent and consistent presentation, but minor inaccuracies in definitions are made.
<i>Satisfactory</i>	An insufficiently detailed and consistent answer to the question(s) posed. Knowledge of only the basic material. Inaccuracies and difficulties with the formulation of definitions are made.
<i>Unsatisfactory</i>	No answer has been given to the basic questions on the discipline..

3.4. Criteria and grading system of the class attendance

Student attendance is determined in percentage correlation

Points	Assessment criteria
20	attendance 75-100%
17	attendance 50-74%
14	Attendance is less than 50%

4. Criteria and grading system of the discipline (module) results during the interim assessment

Criteria and grading system of the discipline (module) results (examination)

For the disciplines that are graded upon examination, the interim assessment result is comprised of points gained during the formative assessment and after the examination:

Assessment materials include the list of questions and tasks for the examination:

1. Chemical nature, physico-chemical properties and biological role of enzymes. Localization and compartmentalization of enzymes in cells and tissues.
2. The mechanism of action of enzymes: the theories of Fischer, Koshland. The stages of enzymatic catalysis.
3. Kinetics of enzymatic reactions. Regulation of enzyme activity: nonspecific, specific. The role of hormones and secondary messengers in the regulation of enzyme activity. Units of enzyme activity.
4. Classification and nomenclature of enzymes.
5. The use of enzymes in medicine.
6. The history of the development of the doctrine of biological oxidation: the theories of Bach, Palladin.
7. The Krebs cycle is a universal stage in the utilization of proteins, fats and carbohydrates and the formation of tissue respiration substrates. Reactions, the energy balance of one revolution.
8. The oxidase pathway of oxygen use in the cell is oxidative phosphorylation.
9. The structure of the components of the redox chain, their localization and functions in the inner membrane of mitochondria. The mechanism of conjugation of oxidation and phosphorylation.
10. P/O ratio. Mitchell's chemiosmotic theory.
11. Respiratory control as the main mechanism of regulation of the conjugation of oxidation and phosphorylation. Mechanisms of dissociation of oxidation and phosphorylation.
12. Mono- and dioxygenase pathways of oxygen utilization in the cell.
13. Peroxidase and radical ways of using oxygen.
14. Carbohydrates, classification.
15. Mechanisms of carbohydrate digestion. Characteristics and action of enzymes involved in the abdominal and parietal digestion of carbohydrates. Mechanisms of carbohydrate absorption.
16. Impaired digestion and absorption of carbohydrates – malabsorption syndrome: concept, biochemical causes, metabolic disorders and consequences, mechanisms of development of the leading typical symptoms.

17. Ways of intake and conversion of carbohydrates in body tissues. Glucose transporters: types, structural features, functions.
18. Anaerobic glycolysis.
19. Aerobic glycolysis.
20. Pyruvate dehydrogenase complex: composition, structure, function.
21. Mechanisms of shuttle transport of glycolytic hydrogen through the mitochondrial membrane.
22. The Pasteur effect, meaning.
23. Glucose catabolism by the mechanism of the pentose phosphate pathway.
24. Glycogen metabolism (breakdown and synthesis).
25. Hyper- and hypoglycemia: causes, mechanisms of urgent and long-term compensation. Metabolic and clinical consequences of acute and chronic hyper- and hypoglycemia.
26. Type I and II diabetes mellitus: causes, metabolic disorders, clinical manifestations, biochemical diagnosis, prevention.
27. Biochemical causes and mechanisms of development of acute complications of diabetes mellitus: hyper- and hypoglycemic coma.
28. Biochemical mechanisms of development of chronic complications of diabetes mellitus: neuropathies, micro- and macroangiopathies and related metabolic and clinical manifestations and consequences, prevention.
29. Biochemical diagnostics of carbohydrate metabolism disorders.
30. Galactose metabolism, galactosemia.
31. Fructose metabolism, fructosemia.
32. The most important lipids of animal and plant origin, their classification, structures, properties, and biological role.
33. Mechanisms of digestion and absorption of lipids. Lipolytic enzymes, bile. Steatorrhea: causes, consequences.
34. Blood transport lipoproteins. Classification of hyperlipoproteidemia.
35. Biosynthesis of triacylglycerides.
36. Biosynthesis of phospholipids.
37. The role of carnitine in the transport of fatty acids.
38. Mechanisms of β -oxidation of fatty acids: stages, reactions, regulation, energy balance.
39. Mechanisms of lipid peroxidation, importance in cell physiology and pathology.
40. Biosynthesis of fatty acids.
41. Synthesis of cholesterol. Hypercholesterolemia. Atherosclerosis. The coefficient of atherogenicity.

42. Mechanisms and levels of regulation and integration of lipid metabolism (central, inter-organ, metabolic).

43. Obesity: age and gender characteristics, calculated indicators of the degree of obesity, biochemical causes, biochemical diagnosis, complications, mechanisms of interrelation with diabetes mellitus and atherosclerosis.

44. Amino acids. Classification, biological role.

45. Peptides, groups of peptides by physiological significance.

46. The structural organization of proteins.

47. Classification of proteins. Simple proteins.

48. Classification of proteins. Complex proteins

49. Nitrogen balance.

50. Digestion of proteins in the gastrointestinal tract. Proteolytic enzymes. Formation and secretion of HCl. Enzymatic hydrolysis of proteins in the gastrointestinal tract.

51. Putrefaction of proteins in the intestine. The role of UDP-glucuronic acid and PAPS in the processes of neutralization and elimination of putrefaction products.

52. Impaired digestion and absorption of proteins. Protein deficiency: causes, metabolic and clinical consequences, prevention.

53. Common pathways of amino acid metabolism. Transamination reactions.

54. Common pathways of amino acid metabolism. Deamination reactions.

55. Common pathways of amino acid metabolism. Decarboxylation reactions.

56. Ways of using nitrogen-free amino acid residues.

57. Ornithine cycle.

58. Structural organization of DNA.

59. The structural organization of RNA.

60. Types of RNA.

61. DNA synthesis. Stages of replication.

62. Repair of errors and DNA damage.

63. Biosynthesis of RNA. The stages of transcription.

64. Post-transcriptional modifications of RNA.

65. Properties of the genetic code.

66. Protein biosynthesis. Stages of the broadcast.

67. Hormones, classification, properties.

68. A unified functional system of hormonal regulation.

69. Mechanisms of action of hormones on target cells.

70. Adenylate cyclase system.

71. Phosphoinositide system.
72. The mechanism of action of steroid hormones and thyroxine.
73. Thyroid gland, hormones, hypo- and hyperfunction.
74. Parathyroid glands, hormones, hypo- and hyperfunction.
75. Pancreas, hormones, hypo- and hyperfunction.
76. Adrenal medulla, hormones, pathology.
77. Adrenal cortex, glucocorticoids, pathology.
78. Adrenal cortex, mineralocorticoids, pathology.
79. Biochemistry of the muscular system. A muscle fiber is a functional unit of muscle tissue. Features of its structure, intracellular and chemical composition. Features of the metabolism of proteins, carbohydrates, lipids.
 80. Mechanisms of contraction, regulation and energy supply, at rest and load, in various types of muscle tissue.
 81. The main functional disorders of the muscles: myopathy, myodystrophy, coronary heart disease, myocardial infarction - biochemical causes, metabolic disorders, consequences.
 82. Biochemistry of the nervous system. The brain: the chemical composition of the dry residue, white and gray matter, neurons, synapses, nerve fibers. Features of metabolism – energy, carbohydrate, lipid, protein, amino acid, nucleotide.
 83. Biochemical foundations of nervous activity, mechanisms of transmission of a nerve impulse along a nerve fiber. Types of synapses and receptors, neurotransmitter exchange and mechanisms of nerve impulse transmission through synapses.
 84. Physiologically active peptides of the brain and the biochemical basis of emotions, memory, pain, sleep.
 85. Metabolic disorders of biogenic amines in mental conditions. Biochemical parameters of blood and urine, reflecting the functional state of the nervous tissue.
 86. Biochemistry of the liver. The role of the liver in carbohydrate, lipid and protein metabolism. Bilirubin exchange. Jaundice.
 87. Vitamins: definition, classification and nomenclature. Types of vitamin metabolism disorders: hyper-, hypo-, vitamin deficiency.
 88. Water-soluble vitamins.
 89. Fat-soluble vitamins.
 90. Vitamin-like substances.

EXAMINATION CARD № 1**on the discipline “Biochemistry”**

Question 1. Chemical nature, physico-chemical properties and biological role of enzymes. Localization and compartmentalization of enzymes in cells and tissues.

Question 2. Fructose metabolism, fructosemia.

Question 3. Ways of using nitrogen-free amino acid residues.

The examination cards were reviewed and approved at the department meeting dated «12» March 2024, record no. 7

Head of the Clinical Medicine Department _____ Krivenko O.G.

Grade	Answer assessment criteria
<i>Excellent</i>	Student understands the material thoroughly; reproduces it fully, clearly and logically; applies theory to practice; has no inhibitions in answering an altered question. Uses specific terminology; demonstrates extensive knowledge in the subject; provides references to specialized resources, including online-resources, while answering the questions.
<i>Good</i>	Student understands the material thoroughly; reproduces it logically and to the point, without major errors in answering the question; uses specific terminology well; may experience some difficulties in answering clarifying questions on the subject; generally demonstrates extensive knowledge in the subject
<i>Satisfactory</i>	Student understands only basic material without details; makes mistakes and not fully correct wording; is poorly familiar with specific terminology; makes significant mistakes in answering; poorly uses special information resources.
<i>Unsatisfactory</i>	No answer to the posed question was given.

The grade, earned at the examination, is then converted into points (“5/excellent” – 20 points; “4/good” – 15 points; “3/satisfactory” – 10 points) and is added to the points, earned during the current assessment.

Final grade	Total sum of points	Assessment criteria
<i>Excellent</i>	91 - 100	All checkpoints of the formative assessment have been completed at a high level. The exam is passed.
<i>Good</i>	81-90	All checkpoints of the formative assessment have been completed. The exam is passed.
<i>Satisfactory</i>	70- 80	Checkpoints of the formative assessment have been completed partially. The exam is passed.
<i>Unsatisfactory</i>	69 or less	Checkpoints of the formative assessment have not been completed or the exam is not passed

5. Diagnostic tasks for the assessment of educational results in the discipline (module) within the framework of internal and external independent assessment of the quality of education

Assessment materials contains tasks for assessing knowledge, skills and abilities that demonstrate the level of competence mastery and indicators of their mastery.

The set of tasks is designed so as to assess each competence in written form.

The set of tasks includes: *multiple-choice test and test with detailed answer.*

Set of tasks for diagnostics

Variant 1

<i>YK-1 Can design action plans and apply systematic approach to critical analysis of problem situations</i>	
Test	<p>1. Source of ribose-5-phosphate formation for nucleotide synthesis: A. glycolysis; B. ornithine cycle; C. the pentose phosphate pathway of glucose oxidation; D. Krebs cycle.</p> <p>2. Na⁺-K⁺-ATPase is activated under the condition of: A. increasing the concentration of Na⁺ ions in the cell; B. excess ATP in the cell; C. increasing the concentration of K⁺ ions in the cell; D. reducing the concentration of Na⁺ in the cell; E. increasing the electric potential difference on the membrane.</p> <p>3. The membranes include: A. hydrophobic proteins; B. cholesterol esters; C. amphiphilic proteins and lipids; D. sphingozin; E. triacylglycerol.</p> <p>4. Which enzymes are involved in lipolysis of triacylglycerol: A. phospholipase A; B. lipases; C. Phosphatase; D. Phospholipases; E. phosphodiesterase.</p> <p>5. Transcription enzyme: A. DNA polymerase; B. DNA helicase; C. RNA polymerase; D. DNA topoisomerase.</p> <p>6. As a result of the deamination reaction, the cleavage of ... occurs ... amino group</p> <p>7. With facilitated diffusion, substances are transferred through the membrane... concentration. ... by gradient ...</p> <p>8. The hormone... activates lipogenesis ... insulin ...</p> <p>9. The sequence of DNA nucleotides recognized by RNA polymerase as a starting point for the start of transcription, - the promoter</p> <p>10. Pentose ... is a part of RNA. ... ribose ...</p>
Case task	<p>How many ATP molecules are synthesized during oxidation: one molecule of pyruvate to 2-oxoglutarate; one molecule of isocitrate to succinate; one molecule of succinate to oxaloacetate, provided that dehydrogenase reactions are associated with the respiratory chain? In the 1st case, 6 ATP molecules are synthesized; in the 2nd - 7 ATP molecules; in the 3rd -em - 5 ATP.</p>
<i>OIK-5 Can analyze morphofunctional and physiological indicators as well as pathological processes in human body to achieve professional goals</i>	
Test	<p>1. The greatest activity of aspartate transaminase is found in: A. Skeletal muscles;</p>

	<p>B. kidneys; C. lungs; D. the heart; E. pancreas.</p> <p>2. The content of glucocorticoids in the blood increases with: A. chronic adrenal insufficiency; B. Itsenko-Cushing syndrome; C. pheochromocytoma; D. Addison's disease; E. prolonged use of cytostatic agents.</p> <p>3. What is the most typical sign of vitamin K deficiency in the body: A. damage to the nervous system; B. tendency to thrombosis; C. increased bleeding; D. Osteomalacia.</p> <p>4. Which bilirubin is formed in hepatocytes after the addition of glucuronic acid residues to it: A. direct bilirubin; B. indirect bilirubin.</p> <p>5. What is the main cause of hypoproteinemia in patients with severe liver parenchyma damage: A. loss of plasma proteins in urine; B. disruption of plasma protein biosynthesis processes; C. enhanced catabolism of plasma proteins.</p> <p>6. The biological effect of aldosterone is to increase reabsorption of ... in the kidneys. ... sodium ...</p> <p>7. In primary hypothyroidism, ... hormone level is increased. ... thyroid- stimulating ...</p> <p>8. The protein that transports iron in the blood is transferrin</p> <p>9. ... diabetes develops with a lack of vasopressin. diabetes insipidus...</p> <p>10. The transformation of fibrinogen into fibrin is catalyzed by the enzyme thrombin</p>
Case task	<p>Eating confectionery and sweets causes vomiting and diarrhea in a child. He does not tolerate sweet tea well, whereas milk does not cause negative reactions. Make a suggestion about a molecular defect.</p> <p>It can be assumed that disaccharidase is caused by the absence of sucrose. A possible cause of these symptoms may also be hereditary fructose intolerance (fructose-1-phosphate aldolase defect).</p>

Variant 2

<i>YK-1 Can design action plans and apply systematic approach to critical analysis of problem situations</i>	
Test	<p>1. As a result of transamination, the amino acid is converted into: A. α-hydroxyacid; B. α-ketoacid; C. β-hydroxyacid; D. aldehyde acid.</p> <p>2. Substrate phosphorylation in glycolysis occurs in a reaction catalyzed by: A. hexokinase; B. phosphofructokinase; C. pyruvate kinase; D. enolase.</p> <p>3. Ca^{2+}- ATP-ase is localized in: A. plasma membrane;</p>

	<p>B. EPR membrane; C. the inner membrane of the mitochondria; D. the EPR membrane and the inner membrane of mitochondria; E. plasma membrane and EPR membrane.</p> <p>4. Thymidylic acid is formed from: A. deoxyuridylic acid; B. deoxyadenylic acid; C. deoxyguanylic acid; D. deoxycytidylic acid; E. uridylic acid.</p> <p>5. Palmitic acid: A. monounsaturated; B. contains three double bonds; C. contains two double bonds; D. saturated.</p> <p>6. The main energy substrate for nerve tissue cells is ... glucose</p> <p>7. Esters of higher monobasic fatty acids and primary monatomic high molecular weight alcohols are waxes</p> <p>8. Removal of introns in pre-RNA - splicing</p> <p>9. Bonds stabilizing the α-helix, - hydrogen</p> <p>10. In the presence of oxygen, pyruvate is converted to acetyl-CoA</p>
Case task	<p>How many ATP molecules can be synthesized due to the oxidation energy of 1 glucose molecule to CO₂ and H₂O under the following conditions:</p> <p>a) all elements of the respiratory chain function; b) pyruvate dehydrogenase is blocked; c) destroyed mitochondria.</p> <p>a) if all elements of the respiratory chain are functioning - 38 ATP; b) if NADH dehydrogenase - 8 ATP is blocked; c) if mitochondria - 2 ATP are destroyed due to glycolysis.</p>
<p><i>OIK-5 Can analyze morphofunctional and physiological indicators as well as pathological processes in human body to achieve professional goals</i></p>	
Test	<p>1. Irreversible damage to cardiomyocytes is accompanied by an increase in serum: A. alkaline phosphatase; B. ALT; C. Gamma-glutamyltransferase; D. CK-MB.</p> <p>2. Under the influence of ACTH, it is activated by: A. protein catabolism; B. gluconeogenesis; C. lipogenesis; D. all of the above.</p> <p>3. Under the action of intestinal microflora, tryptophan is formed from: A. phenol; B. kadaverin; C. indole; D. putrescin</p> <p>4. Which hormones are biologically related to hyperglycemic factors: A. insulin and glucagon; B. Testosterone and norepinephrine; C. adrenaline and glucagon; D. Parathyroid hormone and cortisol.</p>

	<p>5. Which substance is the starting material for the synthesis of adrenaline and norepinephrine: A. tyrosine; B. glycerin; C. glucose; D. cholesterol.</p> <p>6. Mercaptan is a decomposition product of ... amino acids. ... sulfur-containing ...</p> <p>7. Fatty acids are transported in the blood with the help of proteins albumins</p> <p>8. Vitamin ... is necessary in the hydroxylation reactions of proline and lysine in the composition of procollagen during its maturation. ... C ...</p> <p>9. Enzymes involved in the hydrolysis of phospholipids - phospholipases ...</p> <p>10. The synthesis of almost all proteins in eukaryotes begins with an amino acid methionine</p>
Case task	<p>The child's blood glucose was determined in the laboratory. Before that, he was crying. The analysis showed an increased glucose content. Is it possible to say that a child has diabetes mellitus? (What hormones regulate blood glucose levels? What is diabetes mellitus?) The child has hyperglycemia due to stress.</p>