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## Assessment tools for midterm assessment

### Biochemistry

Curriculum	31.05.01
Qualification	General Medicine
Form of education	Full-time
Department	Morphology and physiology
Graduate Department	Internal diseases

### CONTROL WORK - ABSTRACT

Writing an abstract involves a deep study of the designated problem.

**Abstract** (from Lat. refero-report, report) is a special essay that defines goals, objectives and conclusions that set out the main provisions of the topic or problem.

The subject of research papers is presented in the Funds of assessment tools and in teaching aids for independent work of the resident of the corresponding work program.

Abstracts are presented at the lesson according to the chosen topic and calendar-thematic plan, and are submitted to the teacher strictly within the specified time.

The summary of the selected information should be embedded in the text in accordance with a certain logic. The abstract consists of three parts: introduction, main part, conclusion.

a) in the introduction, it will be logical to justify the relevance of the topic (why this topic was chosen, how it is related to modernity and science);

goal (must correspond to the topic of the abstract);

tasks (ways to achieve a given goal) are displayed in the title of the work paragraphs.

b) the main part describes and analyzes the topic of the abstract as a whole, and then – a concise presentation of the selected information in accordance with the tasks set. At the end of the chapter, a conclusion (sub-conclusion) should be made, which begins with the words: "So...", "Eventually...", "At last...", "Finally...", "In conclusion...", "Summing up..." etc.

c) the conclusion contains outputs on chapters (1-1. 5 sheets). It is appropriate to express your point of view on the problem under consideration.

The abstract can be presented in the form of a presentation, and it is mandatory to meet the basic requirements for the abstract, including the correctness of the list of references!

Disclosure of the topic of the abstract assumes the presence of several specialized sources (at least 8-10 publications, monographs, reference books, textbooks) as a source of information. Preference is given to publications in specialized journals and monographs of recognized experts in the relevant field of knowledge. It is mandatory to use foreign literature.

### Term 3

#### List:

1. Neuropeptides and their biological role
2. Blood Peptides, formation and biological functions
3. Methodological foundations of Sanger's discovery of the primary structure of bovine insulin. Significance of this discovery for the development of biochemistry
4. Homologous proteins and their possible use in medicine
5. The use of antivitamin in medicine

6. Functional organization of enzymes as a basis for regulating enzyme activity
7. Using the principles and mechanisms of regulation of enzymatic reactions in medicine
8. About DNA and Levin
9. The use of polymerase chain reaction for the diagnosis of infectious, neoplastic and other diseases
10. What is the meaning of meaningless codons?
11. The role of chaperones in protein molecule folding and pathology development
12. Oxygen in a living cell-good and evil
13. Biochemical bases of ion pumps functioning

#### **Term 4**

##### **List:**

1. Prostaglandins are a type of signaling molecules. Use in medicine
2. Glycogen diseases
3. The value of the pentose pathway for the functioning of red blood cells
4. Features of fructose and galactose metabolism
5. The role of intestinal-hepatic bile acid circulation in the normalization of cholesterol concentration
6. Mechanism of ketogenesis in diabetes mellitus
7. The role of low-density lipoprotein cholesterol in the development of atherosclerosis
8. Criteria for the biological value of dietary protein
9. Biochemical basis of the mechanism of toxic action of ammonia
10. Biochemical mechanism of gout development, the role of uric acid
11. Acute Phase Proteins, their biological role and diagnostic significance
12. Biochemical mechanism of carcinogenesis
13. Biochemical basis for the development of mucopolysaccharidoses
14. Causes and diagnostic value of determining glucose, protein, blood, bile pigments in the urine.
15. Practical use of liposomes.
16. What did L. Poling for vitaminology?
17. How to treat genetically modified foods
18. Decoding the human genome is the greatest achievement of molecular biology.
19. Use of physical and chemical properties of proteins in medicine

#### **MIDTERM ASSESSMENT (EXAM) 4<sup>TH</sup> TERM**

Midterm assessment is carried out in the form of exam. Tasks for the exam include two theoretical questions and one case study.

<b>List of theoretical questions for oral quiz</b>
<p><b>Theoretical questions for the static biochemistry section</b></p> <ol style="list-style-type: none"> <li>1. The amino acid composition of proteins. Formation and nomenclature of peptides. Natural peptides.</li> <li>2.</li> <li>3. Primary structure of proteins.</li> <li>4. Conformation of globular proteins (secondary, tertiary and quaternary structures).</li> <li>5. Structural organization of fibrillar proteins.</li> <li>6. General characteristics of the physicochemical properties of proteins (hydration, solubility, ionization, denaturation and renaturation).</li> </ol>

7. Nomenclature and general principles of protein classification. Classification of simple and complex proteins.
8. Functions of proteins.
9. Vitamins and their biological role. Coenzyme function of vitamins. Provitamins and Antivitamins. The concept of hypo- and hypervitaminosis. General understanding of vitamin therapy and coenzyme therapy.
10. The structure, metabolism and function of vitamin A.
11. The structure, metabolism and functions of vitamin D.
12. Structure, metabolism and functions of vitamin E.
13. The structure, metabolism and functions of vitamin K.
14. Structure, metabolism and functions of vitamin B1.
15. Structure, metabolism and function of vitamin B2.
16. Structure, metabolism and functions of pantothenic acid.
17. Structure, metabolism and functions of vitamin PP.
18. Structure, metabolism and functions of vitamin B6.
19. Structure, metabolism and functions of vitamin B12.
20. Structure, metabolism and functions of vitamin Bc.
21. Structure, metabolism and functions of vitamin C.
22. Structural organization of enzymes: characteristics of one- and two-component enzymes and their components; isozymes; polyenzyme systems.
23. Functional organization of enzymes. Interaction of the active center of the enzyme with the substrate.
24. Substrate specificity and specificity of action. Enzyme nomenclature and classification.
25. General characteristics of the principles and mechanisms of regulation of enzymatic reactions. Regulation of enzyme activity by covalent modification.
26. Kinetics of enzymatic reactions, their dependence on the amount of substrate and enzyme. Effect of temperature and pH on enzyme activity.
27. DNA - nucleotide composition (Chargaff's rules), primary, secondary, tertiary structures.
28. DNA synthesis (replication, repair, reverse transcription).
29. DNA functions. Genome organization.
30. General characteristics of RNA. Types of RNA. RNA synthesis. Functions.
31. Translation and post-translational modification of proteins.
32. The structure and function of biomembranes.
33. Transmembrane transport of substances - diffuse and active transport.
34. The structure and function of hormones.
35. Functional relationship of endocrine glands and the basis of neuro-endocrine regulation of metabolism.
36. Mechanisms of hormone action.
37. The main carbohydrates of animals and their biological role.
38. Digestion and absorption of carbohydrates. General characteristics of the ways of using glucose in the body.
39. Lipids - classification, structure, functions.
40. Biological role and general characteristics of the exchange of water, sodium and potassium. Diagnostic value of sodium and potassium determination in blood serum.
41. The biological role of calcium and inorganic phosphates. General characteristics of phosphate-calcium metabolism. Diagnostic value of determination of calcium and inorganic phosphates in blood serum.

#### **Theoretical questions on dynamic biochemistry.**

1. General characteristics of metabolism and energy. The relationship of metabolism and energy.

2. Common pathway of catabolism. Oxidative decarboxylation of pyruvate.
3. The tricarboxylic acid cycle - regulation, importance, role of vitamins B1, B2, PP and pantothenic acid.
4. General characteristics of biological oxidation. Oxygen consumption routes. Mitochondrial electron transport chains, the role of vitamins B2 and PP.
5. ATP and its biological role, ways of ATP formation. Mechanisms of oxidative and substrate phosphorylation.
6. METC inhibitors. Separation of oxidation and phosphorylation processes. Free oxidation and heat generation.
7. Glycogen - structure, biological role, synthesis, mobilization, regulation of glycogen metabolism. Glycogenous diseases.
8. Anaerobic ways of decomposition of carbohydrates - glycolysis, glycogenolysis and their regulation, alcoholic fermentation and alcohol metabolism. The role of vitamins B1, PP and pantothenic acid.
9. Gluconeogenesis, regulation, the role of vitamins H and PP. The relationship between glycolysis and gluconeogenesis (the Corey cycle). Diagnostic value of lactate determination.
10. Aerobic dichotomous decomposition of carbohydrates, the role of vitamins B1, B2, PP and pantothenic acid, malate-aspartate shuttle mechanisms of hydrogen transfer from the cytosol to mitochondria, regulation of the process.
11. Phosphogluconate pathway of conversion of carbohydrates, the role of vitamins B1 and PP, regulation of the process.
12. Neuro-endocrine regulation of carbohydrate metabolism. The role of insulin, glucagon, adrenaline, glucocorticoids, somatostatin and somatotropin.
13. Lactate and ketoacidosis, causes and consequences.
14. Digestion and absorption of lipids. Bile acids - structure, biological role, synthesis and regulation.
15. Blood lipids. Lipoproteins - classification, structure, lipoproteins, transporting triacylglycerols.
16. Fatty acids - structure, biological role, synthesis and its regulation. The role of vitamins PP, H and pantothenic acid. Diagnostic value.
17.  $\beta$ -oxidation of fatty acids and its regulation. The role of vitamins B2, PP and pantothenic acid. Diagnostic value.
18. Ketone bodies - structure, biological role, synthesis and its regulation, utilization. Diagnostic value.
19. Acylglycerols - structure, biological role, synthesis, mobilization from adipose tissue and its regulation. Diagnostic value.
20. Cholesterol - structure, biological role, synthesis and its regulation, the role of PP vitamins and pantothenic acid in cholesterol synthesis. Diagnostic value.
21. Glycerophospholipids - structure, biological role, synthesis and its regulation, decay. Sphingolipids - the concept of structure and biological role. Diagnostic value
22. General characteristics of sources and ways of consumption of amino acids in tissues.
23. Digestion of proteins. Absorption of protein digestion products. Decay of proteins (amino acids) in the intestine.
24. Components, chemical properties and acidity of gastric juice in pathological conditions. Diagnostic value.
25. General characteristics of amino acid catabolism. Ketogenic and glycogenic amino acids.
26. Transamination, the role of vitamin B6. ALT and ASAT and their diagnostic value.
27. Deamination of amino acids. The role of vitamins B6 and PP.
28. Ornithine cycle of urea formation. Synthesis of creatine. Diagnostic value of the determination of urea. The diagnostic value of determining the activity of creatine kinase in the blood serum.
29. Exchange of ammonia. The mechanism of the toxic action of ammonia.

30. . Biogenic amines - formation and inactivation. The role of vitamins B6. Histamine, serotonin, catecholamines, GABA and their biological role.
31. Neuro-endocrine regulation of amino acid metabolism. The role of insulin, growth hormone, glucocorticoids, sex hormones, thyroxine. Hereditary disorders of amino acid metabolism.
32. Synthesis, degradation of purine and pyrimidine nucleotides. Gout. Diagnostic value of determination of uric acid in blood serum.
33. The relationship between carbohydrate and lipid metabolism.
34. The relationship of the metabolism of carbohydrates, amino acids and nucleotides.
35. Hemoglobin - structure, biological role, synthesis and regulation. Diagnostic value.
36. General characteristics and bio role of blood plasma proteins. "Acute phase" proteins. Diagnostic value of determination of total protein in blood serum.
37. Decomposition of hemoglobin, bile pigments.
38. Detoxifying function of the liver.
39. The role of the liver in lipid, carbohydrate, protein metabolisms
40. Proteoglycans - structure, biological role, synthesis, decay. Mucopolysaccharidoses. The structure and function of fibronectin.

#### **List of practical questions for oral quiz**

1. Why is there a decrease in urine output during stress?
2. In inflammation of the renal tissue, an increase in renin secretion occurs. Can this affect the value of blood pressure?
3. Why does the absorption of calcium decrease with reduced acidity of gastric juice?
4. Why is parathyroid hormone in conditions of vitamin D deficiency unable to maintain the concentration of calcium in the blood?
5. What are the consequences of a sharp decrease in the concentration of sodium in the blood, for example, during transfusion of hypotonic fluid?
6. What vitamin D metabolite will be needed for kidney disease?
7. What case will the blood glucose concentration be higher after taking glucose or fructose?
8. Explain the mechanism of development of vitamin D resistant rickets.
9. Why does the metabolism of carbohydrates in nerve cells entirely depend on the concentration of glucose in the blood?
10. Is it possible to carry out reactions of the ornithine cycle with the block of reactions of the tricarboxylic acid cycle?
11. What is the difference in liver and muscle glycogen function?
12. If the lactate dehydrogenase reaction is inhibited, how will this affect the rate of glycolysis in general?
13. Why are glycolysis enzymes always in excess in cells?
14. Can ethanol be converted into glycogen in the body? Explain the answer
15. In an experiment, avidin, which is a potent specific inhibitor of biotin enzymes, was added to the liver cell homogenate. Which of the listed transformations will be blocked a) glucose to pyruvate, b) pyruvate to glucose, c) oxaloacetate to glucose, d) pyruvate to acetyl-CoA
16. Does fasting tolerance largely depend on fat stores or muscle mass?
17. Why is the old custom of giving whiskey or brandy to those who are rescued at sea or in the wilderness to hungry and exhausted people physiologically unjustified?
18. What substrates will be used in gluconeogenesis during fasting?
19. Which organ's decreased functional activity is indicated by the accumulation of lactate in the blood while aerobic metabolic conditions persist?
20. What substrate will be used in gluconeogenesis after intense muscular work?
21. Why should a diabetic patient eat something containing carbohydrates after 2 hours after eating and administering insulin?
22. An athlete's blood glucose level rises to 6.5 mmol/l and the level of fatty acids to 1.2 mmol/l

- before a responsible start. What is the reason for the observed changes?
23. Explain the mechanism of development of lactic acidosis in case of respiratory poisoning.
  24. Explain the mechanism of development of lactic acidosis in alcohol poisoning.
  25. Explain the mechanism of development of lactic acidosis in liver cirrhosis.
  26. Patients with diabetes mellitus have hypercholesterolemia. Are there metabolic prerequisites for enhanced cholesterol synthesis in such patients?
  27. Why do people consumed large amounts of carbohydrates show a higher readiness to convert glucose to triacylglycerols?
  28. What indicator can be used to assess the functional activity of  $\beta$ -cells of the pancreas in patients with diabetes mellitus receiving insulin?
  29. What are three reasons that determine the development of hyperglucosemia in diabetes mellitus?
  30. Why is gallstone disease more common in women than in men?
  31. Triacylglycerols are absorbed from the intestine mainly in the form of their digestion products - monoacylglycerols and fatty acids, and in the blood in the composition of chylomicrons monoacylglycerols and fatty acids are practically absent. Explain this phenomenon.
  32. Is it possible to consider milk as a dietary product that creates functional rest of the liver?
  33. Which of the following indicators will be changed with the development of hemolytic jaundice? 1. Total bilirubin 2. Direct bilirubin 3. Indirect bilirubin 4. Hemoglobin 5. Potassium 6. AlaAT 7. Alkaline phosphatase 8. Gamma-glutamyltranspeptidase 9. Bilirubin of urine 10. Urobilinogen
  34. Is it possible to disturb the digestion of triacylglycerols under the action of a trypsin inhibitor?
  35. Is it possible to reduce the rate of synthesis of bile acids from cholesterol with a deficiency of vitamin C?
  36. What is the importance of impaired synthesis of phosphatidylcholines for the development of fatty liver infiltration?
  37. Indicate the cause of steatorrhea if fatty acids, monoacylglycerols, diacylglycerols, a small amount of triacylglycerols are found in the patient's feces. Is it possible that the absorption of fat-soluble vitamins is impaired in this digestive disorder?
  38. Indicate the cause of steatorrhea if triacylglycerols and small amounts of fatty acids are found in the patient's feces. Is it possible that absorption of fat-soluble vitamins is impaired in this digestive disorder??
  39. Why is it possible to increase the fraction of high density lipoprotein cholesterol when taking unsaturated fatty acids?
  40. Can you expect to lose weight when consuming carnitine?