



Ministry of Public Health of Ukraine

O. O. BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

Department of Bioorganic and Biological Chemistry

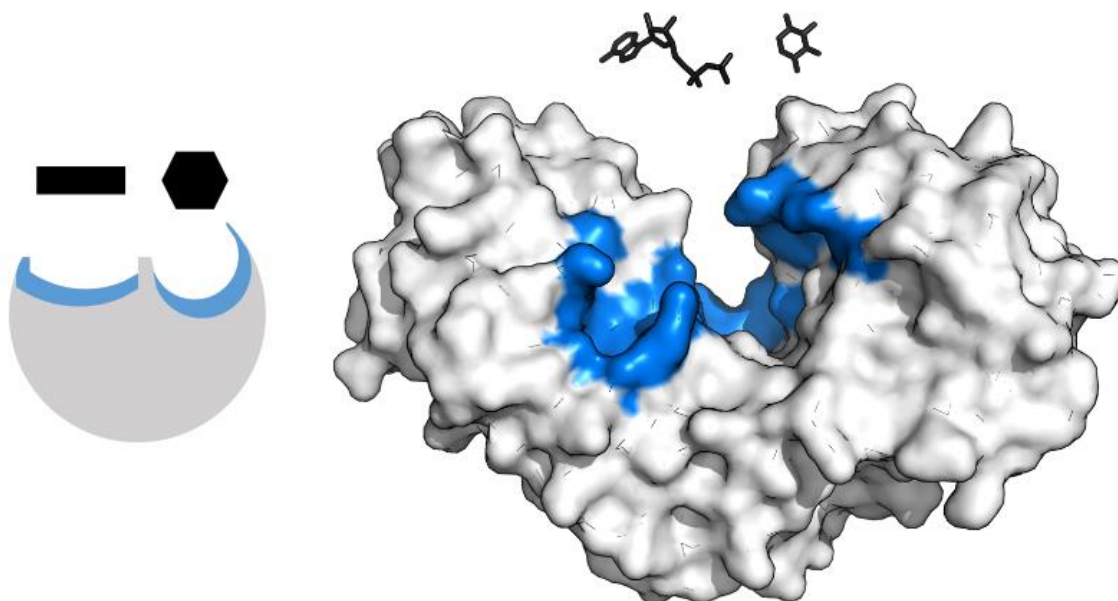
LIST OF TEST QUESTIONS

for preparation of Content module № 2

***"General regularities of metabolism of
carbohydrates, lipids, amino acids"***

FOR STUDENTS OF THE 2ST YEAR OF STUDY

OF MEDICAL and STOMATOLOGICAL FACULTIES



Kyiv-2018

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At the cycle commission meeting for medical and biological disciplines in O.O. Bogomolets National Medical University in the form List of test questions for preparation of Content module № 2 "General regularities of metabolism of carbohydrates, lipids, amino acids" for students of the 2st year of study of medical and stomatological faculties, protocol № 2 from 12th of November 2018.

At the meeting of the bioorganic and biological chemistry department in O.O. Bogomolets National Medical University in the form List of test questions for preparation of Content module № 2 "General regularities of metabolism of carbohydrates, lipids, amino acids" for students of the 2st year of study of medical and stomatological faculties, protocol № 7 from 07th of November 2018.

The system of licensed integrated examinations is a complex of means of standardized verification of the level of professional competence, which is an integral part of the state certification of students who are being trained the specialties "Medicine" and "Pharmacy".

The purpose of the licensed integrated exam is to establish the compliance of the level of professional competence of the graduate with the minimum required level in accordance with the requirements of the State standards of higher education. Professional competence is defined as the ability to apply knowledge and understanding of fundamental biomedical sciences and basic medical disciplines that are basic to assisting the patient under the supervision of a more experienced physician.

The Licensed Integrated Exam includes one, two or three separate test assignments, depending on the educational qualification level. The content of the test tasks of the licensed integrated exam is approved annually by the Ministry of Health of Ukraine and should correspond to educational and professional programs.

Future specialists of the "Specialist" and "Master" levels (doctors, dentists, pharmacists, psychologists, etc.) consistently take three exams - Step 1, Step 2, and Step 3.

"Step 1" - is an exam of general scientific sciences, which is passed after studying the basic fundamental disciplines, which are part of "Step 1". The test exam is on the 3rd course (future physicians and dental practitioners).

The value of the "passed" criterion is approved by the Ministry of Health of Ukraine (Order of the Ministry of Health of Ukraine dated 05.10.2016 №1043) and makes up 60.5% of the correct answers. For all students who received on the test exams "Step 1" result "unpassed," is allowed to

re-pass of "Step 1" not more than two times before the nearest session in terms approved by the Ministry of Health of Ukraine. In case of not retaking the exam «Step 1», the student is not allowed to the next examination session and deducted from a higher educational institution as having failed to complete the curriculum.

The content of the exam "Step 1. Dentistry" is: microbiology (6-8%), biology (7-9%), histology (9-11%), pathological anatomy (10-14%), pharmacology (10-14%). , normal physiology (10-14%), pathological physiology (10-14%), biological chemistry (10-14%), normal anatomy (13-17%).

The content of the exam "Step 1. General medical preparation" consists of: histology (4-6%), biology (6-8%), microbiology (7-9%), normal anatomy (9-11%), pathological anatomy (10-14%), pharmacology (11-15%), normal physiology (13-17%), pathological physiology (13-17%), biological chemistry (13-17%).

The collection of test tasks for biological chemistry for preparation for the license exam "Step 1. General medical preparation" and "Step 1. Stomatology" is intended for students of the 2nd year of medical faculties, medical-psychological, dental faculties and faculty of training of doctors of the armed forces of Ukraine. About 400 test tasks are included, which are grouped according to the themes of the content module №2 "General regularities of metabolism of carbohydrates, lipids, amino acids". Test tasks are standardized, each of them has one correct answer (format A). Individual work with test tasks will help improve the quality of the studied material and prepare for the license integrated examination "Step 1. General medical preparation" and "Step 1. Dentistry", as well as preparation for the examination on the discipline "Biological chemistry".

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Enzymes and coenzymes. Regulation of metabolism

1. A denaturation of proteins can be found in some substances. Specify the substance that is used for the incomplete denaturation of hemoglobin:
 - A. Urea
 - B. Toluene
 - C. Sulfuric acid
 - D. Nitric acid
 - E. Sodium hydroxide
2. Some proteins of saliva have a protective function. Which of them protects the oral mucosa from the mechanical damage?
 - A. Mucin
 - B. Lysozyme
 - C. Catalase
 - D. Peroxidase
 - E. Renin
3. For the study of serum proteins various physical and physicochemical methods can be used. In particular, serum albumins and globulins can be separated by this method:
 - A. Electrophoresis
 - B. Polarography
 - C. Dialysis
 - D. Spectrography
 - E. Refractometry
4. Electrophoretic study of blood serum of a patient with pneumonia revealed an increase in one of the protein fractions. What fraction is it?
 - A. γ -globulins
 - B. Albumins
 - C. α_1 -globulins
 - D. α_2 -globulins
 - E. β -globulins
5. A woman, 36 years after surgery, received intravenous injection of a concentrated albumin solution. This resulted in the increased movement of water in the following direction:
 - A. From intercellular fluid to capillaries
 - B. From the intercellular fluid to the cells
 - C. From cells to the intercellular fluid
 - D. From capillaries to intercellular fluid
 - E. There will be no change in the flow of water
6. Cationic glycoproteins are the major components of parotid saliva. What amino acids are responsible for their positive charge?
 - A. Lysine, arginine, histidine
 - B. Aspartate, glutamate, glycine
 - C. Aspartate, arginine, glutamate
 - D. Glutamate, valine, leucine
 - E. Cysteine, glycine, proline
7. Parodontitis is accompanied by activation of proteolysis in parodontium tissues. Increase of what oral fluid's component is the evidence of proteolysis activation?
 - A. Amino acids
 - B. Organic acids
 - C. Glucose
 - D. Biogenic amines
 - E. Cholesterol
8. The student used conserved donor blood to determine the time of its clotting. However, any positive result had not been obtained. The reason for this is the lack in this sample of blood:
 - A. Ionized calcium
 - B. Factor Hageman
 - C. Thromboplastin
 - D. Fibrinogen
 - E. Vitamin K
9. Long-term effects on the body of toxic substances led to a significant reduction in protein synthesis in hepatocytes. What organelles suffered from intoxication most?
 - A. Granular endoplasmic reticulum
 - B. Mitochondria
 - C. Microtubules
 - D. Lysosomes
 - E. The Golgi's complex
10. Children with kwashiorkor, along with other signs, violations of the process of dentition were revealed. At the heart of this phenomenon is the insufficient receipt into the body:
 - A. Lipids
 - B. Proteins
 - C. Carbohydrates
 - D. Vitamin C
 - E. Vitamin B₁
11. In the daily diet of an adult healthy person, there must be fats, proteins, carbohydrates, vitamins, mineral salts and water. Specify the daily amount of protein (g) that provides normal life activity of the body:
 - A. 100-120
 - B. 50-60

- C. 10-20
- D. 70-80
- E. 40-50

12. A patient with a hepatic failure has been examined for the electrophoretic spectrum of blood serum proteins. Which of the physico-chemical properties of the protein molecules lie in the basis of this method?

- A. Presence of a charge
- B. Hydrophilicity
- C. Ability to swell
- D. Optical activity
- E. Non-dialysable

13. The surgeon used a 70% solution of ethyl alcohol to disinfect the hands before surgery. What is the main mechanism of antiseptic action of the drug on microorganisms?

- A. Denaturation of protoplasmic proteins.
- B. Interaction with amino groups of protoplasmic proteins.
- C. Interaction with hydroxyl groups of enzymes.
- D. Blockade of sulfhydryl groups of enzyme systems.
- E. Oxidation of organic components of protoplasm.

14. What substance makes saliva viscous and mucous, has protective function, protects mucous membrane of oral cavity from mechanical damage?

- A. Mucin
- B. Glucose
- C. Kallikrein
- D. Amylase
- E. Lysozyme

15. Only one factor can affect the charge of amino acid radicals in the active center of the enzyme. Name of this factor is:

- A. pH
- B. Pressure
- C. Temperature
- D. The presence of a competitive inhibitor
- E. Excess product

16. The conjugated protein necessarily contains special component as a nonprotein part. Choose the substance that can't carry out this function:

- A. HNO_3
- B. ATP
- C. Thiamine pyrophosphate
- D. AMP

E. Glucose

17. 60-year-old man went to the doctor after the appearance of pain in the chest. In blood serum showed a significant increase in the activity of enzymes: CPK and its MB isoform, aspartate aminotransferase. On the development of the pathological process in which tissue do these changes indicate?

- A. Heart muscle
- B. Lungs
- C. Skeletal muscle
- D. Liver
- E. Smooth muscles

18. There are several groups of molecular mechanisms that are important in the pathogenesis of cell damage, which contributes to the development of pathology. What processes provide protein damage mechanisms?

- A. Inhibition of enzymes
- B. Peroxide oxidation of lipids
- C. Acidosis
- D. Osmotic stretching of membranes
- E. Activation of phospholipases

19. It is known that the activity of parotid salivary glands susceptible to age-related changes. The activity of which enzyme will decrease sharply in saliva?

- A. Amylase.
- B. Hexokinase.
- C. Renin.
- D. Maltase.
- E. Phosphatase.

20. For biochemical diagnostics of cardiac infarction it is necessary to determine activity of a number of enzymes and their isoenzymes in the blood. What enzyme assay is considered to be optimal for confirming or ruling out cardiac infarction at the early stage, after the patient develops thoracic pain?

- A. Creatine kinase MB isoenzyme
- B. Creatine kinase MM isoenzyme
- C. LDH_1 isoenzyme
- D. LDH_5 isoenzyme
- E. Cytoplasmic isoenzyme of aspartate aminotransferase

21. For the treatment of some infectious diseases caused by bacteria, sulfonamides drugs are used. What is the mechanism of action of these drugs?

- A. They are antivitamin of p-aminobenzoic acid.
 B. They are allosteric enzyme inhibitors.
 C. They are allosteric enzyme activators.
 D. They participate in redox processes.
 E. They inhibit folic acid absorption.
22. In the intensive care unit entered a man 47-years old with a diagnosis of myocardial infarction. Which of the lactate dehydrogenase (LDH) fractions will prevail in the blood serum during the first two days?
 A. LDH 1
 B. LDH 2
 C. LDH 3
 D. LDH 4
 E. LDH 5
23. Researchers isolated 5 isoenzymic forms of lactate dehydrogenase from the human blood serum and studied their properties. What property indicates that the isoenzymic forms were isolated from the same enzyme?
 A. Catalyzation of the same reaction
 B. The same molecular weight
 C. The same physicochemical properties
 D. Tissue localization
 E. The same electrophoretic mobility
24. One of the means of regulating enzyme activity in a human body is the covalent modification. Glycogen phosphorylase and glycogen synthetase activity is regulated by the following type of covalent modification:
 A. Phosphorylation-dephosphorylation
 B. ADP-ribosylation
 C. Methylation
 D. Hydrolysis
 E. Sulfonation
25. When the patient's blood analysis revealed a significant increase in the activity of MB-forms CPK (CPK) and lactate dehydrogenase-1. What pathology can be assumed?
 A. Myocardial infarction
 B. Hepatitis
 C. Rheumatism
 D. Pancreatitis
 E. Cholecystitis
26. An increase in the activity of LDH₁, LDH₂, AsAT, and creatine kinase was detected in the patient's blood. In which organ of the patient is the most likely development of the pathological process?
 A. Heart
 B. Pancreas
 C. Liver
 D. Kidneys
 E. Skeletal muscle
27. An increase in the activity of LDH 4,5, AlAT, carbamoyl ornithine transferase was detected in the patient's blood. In what organ can assume development of the pathological process?
 A. Cardiac muscle (possible myocardial infarction)
 B. Liver (possible hepatitis)
 C. Skeletal muscle
 D. Kidneys
 E. Connective tissue
28. Albumin concentration in the patient's blood is 2.8 g/l, increased concentration of lactate dehydrogenase 5 (LDH₅). On the disease of what organ does that indicate?
 A. Liver
 B. Kidney
 C. Heart
 D. Lung
 E. Spleen
29. There is increased activity of AST, LDH₁, LDH₂, and CPK in the patient's blood. Pathological process most likely occurs in the:
 A. Heart
 B. Skeletal muscles
 C. Kidneys
 D. Liver
 E. Adrenal glands
30. In the patient's blood plasma the activity of LDH₁ and LDH₂ isoenzymes increased. About which pathology of the body does this mean?
 A. Myocardium
 B. Liver
 C. Kidney
 D. Brain
 E. Skeletal muscle
31. In a patient revealed increased the activity of AsAT, LDH_{1,2}, and creatine phosphokinase. In which organ (s) is the most likely development of the pathological process?
 A. Heart muscle
 B. Skeletal muscle

- C. Kidney and adrenal gland
- D. Connective tissue
- E. Liver and kidneys

32. 49-year-old patient, a driver by profession, complains of unbearable compressive pain behind the sternum, "giving away" to the neck. Pain occurred 2 hours ago. Objectively: the condition is severe, pallor, heart sounds are weakened. Laboratory studies have shown high activity of creatine kinase and LDH₁. What diseases are characterized by such symptoms?

- A. Acute myocardial infarction
- B. Acute pancreatitis
- C. Stenocardia
- D. Cholelithiasis
- E. Diabetes

33. Six hours after myocardial infarction, the lactate dehydrogenase activity in the patient increased in the blood. What isoenzymes should be expected in this case?

- A. LDH 1
- B. LDH 2
- C. LDH 3

- D. LDH 4
- E. LDH 5

34. The high level of lactate dehydrogenase (LDH) isozymes concentration showed the increase of LDH-1 and LDH-2 in a patient's blood plasma. Point out the most probable diagnosis:

- A. Myocardial infarction
- B. Skeletal muscle dystrophy
- C. Diabetes mellitus
- D. Viral hepatitis
- E. Acute pancreatitis

35. Succinate dehydrogenase catalyses the dehydrogenation of succinate. Malonic acid $HOOC - CH_2 - COOH$ is used to interrupt the action of this enzyme. Choose the inhibition type:

- A. Competitive
- B. Allosteric
- C. Non-competitive
- D. Limited proteolysis
- E. Dephosphorylation

Water-soluble vitamins

1. Examination of a patient revealed dermatitis, diarrhea, dementia. What vitamin deficiency is the cause of this condition?
 - A. Nicotinamide
 - B. Ascorbic acid
 - C. Folic acid
 - D. Biotin
 - E. Rutin

2. A patient consulted a doctor about symmetric dermatitis of open skin areas. It was found out that the patient lived mostly on cereals and ate too little meat, milk and eggs. What vitamin deficiency is the most evident?
 - A. Nicotinamide
 - B. Calciferol
 - C. Folic acid
 - D. Biotin
 - E. Tocopherol

3. A 3 year old child with symptoms of stomatitis, gingivitis and dermatitis of open skin areas was delivered to a hospital. Examination revealed inherited disturbance of neutral amino acid transporting in the bowels. These symptoms were caused by the deficiency of the following vitamin:
 - A. Niacin
 - B. Pantothenic acid
 - C. Vitamin A
 - D. Cobalamin
 - E. Biotin

4. A patient is ill with dermatitis, diarrhea, dementia. During history taking it was revealed that the main food stuff of the patient was maize. These disturbances are caused by deficiency of the following vitamin:
 - A. *PP*
 - B. *B1*
 - C. *B2*
 - D. *B9*
 - E. *B8*

5. A 50-year-old man addressed a hospital with complaints of memory disorders, painful sensations along the nerve trunks, decreased mental ability, circulatory disorders and dyspepsia. Anamnesis states excessive alcohol consumption. What vitamin deficiency can result in such signs?
 - A. Thiamine
 - B. Niacin
 - C. Retinol
 - D. Calciferol
 - E. Riboflavin

6. A patient has painfulness along bignerve trunks and excessive content of pyruvate in blood. What vitamin deficit may cause such changes?
 - A. *B1*
 - B. Biotin
 - C. *PP*
 - D. Pantothenic acid
 - E. *B2*

7. A woman who has been keeping to a clean-rice diet for a long time was diagnosed with polyneuritis (beri-beri). What vitamin deficit results in development of this disease?
 - A. Thiamine
 - B. Ascorbic acid
 - C. Pyridoxine
 - D. Folic acid
 - E. Riboflavin

8. A patient has an increased pyruvate concentration in blood. A large amount of it is excreted with the urine. What vitamin is lacking in this patient?
 - A. *B1*
 - B. *E*
 - C. *B3*
 - D. *B6*
 - E. *B2*

9. A patient, who has been subsisting exclusively on polished rice, has developed polyneuritis due to thiamine deficiency. What substance is an indicator of such avitaminosis, when it is excreted with urine?
 - A. Pyruvic acid
 - B. Malate
 - C. Methylmalonic acid
 - D. Uric acid
 - E. Phenyl pyruvate

10. Vitamin *B1* deficiency causes disturbance of oxidative decarboxylation of α -ketoglutaric acid. This leads to the impaired synthesis of the following coenzyme:
 - A. Thiamine pyrophosphate
 - B. Nicotinamide adenine dinucleotide
 - C. Flavine adenine dinucleotide
 - D. Lipoic acid

E. Coenzyme A

11. To improve the trophism of the heart muscle, the patient is prescribed a drug that includes cocarboxylase (thiamine diphosphate) - a coenzyme form of the vitamin:

- A. B₁
- B. B₂
- C. B₅
- D. B₆
- E. B₁₂

12. Pyruvic acid as an intermediate metabolite of carbohydrate, lipid and amino acid metabolism can undergo oxidative decarboxylation. The cause of this process is the lack of the following nutrient in the diet:

- A. Thiamin
- B. Pyridoxine
- C. Ascorbic acid
- D. Citrine
- E. Pangamic acid

13. A patient with chronic alcoholism has symptoms of polyneuritis and cardiac insufficiency. What vitamin preparation should be prescribed to this patient?

- A. Thiamine
- B. Ergocalciferol
- C. Retinol
- D. Rutin
- E. Phylloquinone

14. A 36-year-old female patient has a history of B₂-hypovitaminosis. The most likely cause of specific symptoms (epithelial, mucosal, cutaneous, corneal lesions) is the deficiency of:

- A. Flavin coenzymes
- B. Cytochrome A1
- C. Cytochrome oxidase
- D. Cytochrome B
- E. Cytochrome C

15. Malaria is treated with structural analogs of vitamin B₂ (riboflavin). These drugs disrupt the synthesis of the following enzymes in plasmodium:

- A. FAD-dependent dehydrogenase
- B. NAD-dependent dehydrogenase
- C. Peptidase
- D. Cytochrome oxidase
- E. Aminotransferase

16. In case of enterobiasis acridine - the structural analogue of vitamin B₂ - is administered. The synthesis disorder of which enzymes does this medicine cause in microorganisms?

- A. FAD-dependent dehydrogenases
- B. Cytochrome oxidases
- C. Peptidases
- D. NAD-dependent dehydrogenases
- E. Aminotransferases

17. The preparation complex for periodontitis treatment includes the medicine from the group of water soluble vitamins, bioflavonide derivative, which is prescribed together with ascorbic acid. This preparation has anti-oxidative properties, decreases gingival hemorrhage. What preparation is meant?

- A. Rutin
- B. Calcium pantothenate
- C. Calcium panganate
- D. Cyanocobalamin
- E. Folic acid

18. Examination of a child who hasn't got fresh fruit and vegetables during winter revealed numerous subcutaneous hemorrhages, gingivitis, carious cavities in teeth. What vitamin combination should be prescribed in this case?

- A. Ascorbic acid and rutin
- B. Thiamine and pyridoxine
- C. Folic acid and cobalamin
- D. Riboflavin and nicotinamide
- E. Calciferol and ascorbic acid

19. Examination of a patient with frequent hemorrhages from internals and mucous membranes revealed proline and lysine being a part of collagen fibers. What vitamin absence caused disturbance of their hydroxylation?

- A. Vitamin C
- B. Vitamin K
- C. Vitamin A
- D. Thiamine
- E. Vitamin E

20. In spring a patient experiences petechial haemorrhages, loosening of teeth, high liability to colds. A doctor suspects hypovitaminosis C. In this respect loosening of teeth can be explained by:

- A. Structural failure of collagen in the periodontal ligaments

- B. Structural change of glycosaminoglycans
 C. Increased permeability of periodont membranes
 D. Mechanical damage of teeth
 E. Disturbed oxidation-reduction process in the periodont
21. Most of the members of the expedition of Magellan to America died from vitamin deficiency. This disease was manifested by general weakness, subcutaneous hemorrhage, tooth loss, bleeding from the gums. As the name of this vitamin deficiency?
- A. scurvy (scurvy)
 B. Pellagra
 C. Rickets
 D. Polyneuritis (beriberi)
 E. Biermer's anemia
22. A 10-year-old girl has a history of repeated acute respiratory viral infection. After recovering she presents with multiple petechial hemorrhages on the sites of friction from clothing rubbing the skin. What kind of hypovitaminosis has this girl?
- A. C
 B. B6
 C. B1
 D. A
 E. B2
23. The patient has an increase in the permeability of the walls of blood vessels with the development of increased bleeding and the appearance of small point hemorrhages on the skin, tooth loss. How does the vitamin exchange disorder explain these symptoms?
- A. Hypovitaminosis C
 B. Hypervitaminosis D
 C. Hypervitaminosis C
 D. Hypovitaminosis D
 E. Hypovitaminosis A
24. A 20-year-old male patient complains of general weakness, rapid fatigability, irritability, decreased performance, bleeding gums, petechiae on the skin. What vitamin deficiency may be a cause of these changes?
- A. Ascorbic acid
 B. Riboflavin
 C. Thiamine
 D. Retinol
 E. Folic acid
25. A patient diagnosed with focal tuberculosis of the upper lobe of the right lung had been taking isoniazid as a part of combination therapy. After some time, the patient reported of muscle weakness, decreased skin sensitivity, blurred vision, impaired motor coordination. Which vitamin preparation should be used to address these phenomena?
- A. Vitamin B6
 B. Vitamin A
 C. Vitamin D
 D. Vitamin B12
 E. Vitamin C
26. A 40-year-old male patient with pulmonary tuberculosis was administered isoniazid. What vitamin deficiency can develop as a result of taking this drug for a long time?
- A. Pyridoxine.
 B. Cobalamin.
 C. Biotin.
 D. Thiamine.
 E. Folic acid.
27. What vitamin is a component of glutamic acid decarboxylase, participates in the production of GABA, and its deficiency is manifested by seizures?
- A. Pyridoxine
 B. Cobalamin
 C. Tocopherol
 D. Folic acid
 E. Ascorbic acid
28. A 9-month-old child feeds on artificial mixtures that are not balanced in terms of vitamin B₆ content. A child has pellagra similar dermatitis, convulsions, anemia. The development of seizures may be associated with impaired formation:
- A. GABA
 B. Histamine
 C. Serotonin
 D. DOPA
 E. Dopamine
29. The infant has epileptiform convulsions caused by vitamin B₆ deficiency. This is due to a decrease in the nerve tissue of the inhibitory mediator - γ -aminobutyric acid. What enzyme activity is reduced due to this?
- A. Glutamate decarboxylase
 B. Alanine aminotransferase
 C. Glutamate dehydrogenase

- D. Pyridoxal kinase
- E. Glutamate synthetase

30. In compliance with the clinical presentations a man was prescribed pyridoxalphosphate. What processes are corrected by this preparation?

- A. Transamination and decarboxylation of amino acids
- B. Oxidative decarboxilation of keto acids
- C. Desamination of purine nucleotides
- D. Synthesis of purine and pyrimidine bases
- E. Protein synthesis

31. In the clinical practice for the treatment of tuberculosis drug isoniazid used - antivitamin which is able to penetrate into the tubercle bacillus. The tuberculostatic effect is due to the violation of replication processes, redox reactions, due to the formation of not real coenzyme from:

- A. NAD⁺
- B. FAD
- C. FMN
- D. TDP
- E. KoQ

32. Reactions of intermolecular transport of one-carbon radicals are necessary for the synthesis of proteins and nucleic acids. From which of the following vitamins does the coenzyme form necessary for the above reactions?

- A. Folic acid
- B. Thiamine
- C. Pantothenic acid
- D. Ascorbic acid
- E. Riboflavin

33. In the synthesis of purine nucleotides involved some amino acids, derivatives of vitamins, phosphorus esters of ribose. What coenzyme form of vitamin provides one-carbon fragments for this synthesis?

- A. Folic acid
- B. Pantothenic acid
- C. Nicotinic acid
- D. Riboflavin
- E. Pyridoxine

34. In the normal course of a replication process need thymidylic nucleotides, the synthesis of which occurs with the participation of thymidylate synthetase, are used as a coenzyme:

- A. Methylene tetrahydrofolate

- B. Carboxybiotin
- C. Thiamine diphosphate
- D. Pyridoxal phosphate
- E. Nicotinamide adenine dinucleotide

35. Pterin derivatives (aminopterin and methotrexate) are the inhibitors of dihydrofolate reductase, so that they inhibit the regeneration of tetrahydrofolic acid from dihydrofolate. These drugs inhibit the intermolecular transfer of monocarbon groups, thus suppressing the synthesis of the following polymer:

- A. DNA
- B. Protein
- C. Homopolysaccharides
- D. Gangliosides
- E. Glycosaminoglycans

36. After an extended treatment with sulfanamides a patient has developed macrocyticanemia. Production of active forms of the following vitamin is disrupted in such a condition:

- A. Folic acid
- B. Thiamine
- C. Riboflavin
- D. Pyridoxine
- E. Cyanocobalamin

37. It is known that part of carbon dioxide is used in the body in the biosynthesis of fatty acids, urea, gluconeogenesis, etc. Which vitamin forms the CO₂-transporting form for these reactions?

- A. Biotin
- B. thymine
- C. Riboflavin
- D. Nicotinamide
- E. Retinol

38. A patient was diagnosed with seborrheic dermatitis associated with vitamin H (biotin) deficiency. The patient has disturbed activity of the following enzyme:

- A. Acetyl-CoA-carboxylase
- B. Pyruvate decarboxylase
- C. Alcohol dehydrogenase
- D. Amino transferase
- E. Carbomoyl phosphate synthetase

39. The patient was diagnosed megaloblastic anemia. Specify a vitamin deficiency which can lead to the development of this disease.

- A. Cyanocobalamin.

- B. Rutin.
- C. Nicotinamide.
- D. Thiamine.
- E. Cholecalciferol.

40. 47. A patient 43 years old with chronic atrophic gastritis and hyperchromic megaloblastic anemia increased methylmalonic acid excretion in the urine. The lack of which vitamin caused the occurrence of this symptom complex?

- A. B₁₂
- B. B₂
- C. B₃
- D. B₅
- E. B₆

41. After removing 2/3 of the stomach in the patient's blood, the hemoglobin content decreased, the number of red blood cells increased, the size of these blood cells increased. What vitamin deficiency leads to such changes in the blood?

- A. B₁₂
- B. C
- C. P
- D. B₆
- E. PP

42. In examining the oral cavity of the patient, the dentist paid attention to the presence of an inflammatory and dystrophic process in the mucous membrane (Hunter's glossitis, atrophic stomatitis). A blood test revealed hyperchromic anemia. What factor is the cause of this disease?

- A. Hypovitaminosis B₁₂
- B. Hypovitaminosis B₁
- C. Hypovitaminosis B₆
- D. Increasing pH of the gastric juice
- E. Hypovitaminosis A

43. A year after subtotal stomach resection on account of ulcer of lesser curvature the following blood changes were revealed: anemia, leukocytopenia and thrombocytopenia, color index - 1,3, megaloblasts and megalocytes. What factor deficiency caused the development of this pathology?

- A. Castle's factor
- B. Hydrochloride acid
- C. Mucin
- D. Pepsin
- E. Gastrin

44. In the patient with complaints about pain in the stomach found a decrease in its secretory function, which is accompanied by anemia. What substance deficiency causes the development of B₁₂ hypovitaminosis in a patient and the appearance of anemia?

- A. Castle factor
- B. Thiamine
- C. Biotin
- D. Pyridoxine
- E. Calciferol

45. After the surgical removal of part of the stomach of the patient disrupted the absorption of vitamin B₁₂, it is excreted in the feces. Anemia has developed. What factor is necessary for the absorption of this vitamin?

- A. Gastromukoprotein
- B. Gastrin
- C. Hydrochloric acid
- D. Pepsin
- E. Folic acid

46. In a 65-year-old patient with long-lasting complaints characteristic of chronic gastritis, megalocytes were found in peripheral blood and megaloblastic erythropoiesis in the bone marrow. What is the most likely diagnosis?

- A. B₁₂-folic deficiency anemia
- B. Aplastic anemia
- C. Hypoplastic anemia
- D. Hemolytic anemia
- E. Iron deficiency anemia

47. A 13-year-old girl has been prescribed a certain drug for treatment of megaloblastic anemia. This drug stimulates a transfer from megaloblastic haemopoiesis to normoblastic, participates in synthesis of purine and pyrimidine bases, activates protein and methionine synthesis. What drug does the patient take?

- A. Cyanocobalamin
- B. Erythropoietin
- C. Haemostimulinum
- D. Ferric sulfate
- E. Rosehip tea

48. A 50-year-old patient has been examined by a dentist and found to have crimson smooth tongue. Blood analysis revealed a decrease in RBC level and hemoglobin concentration, colour index of 1,3, symptoms of megaloblastic hematopoiesis, degenerative changes in

WBCs. What blood disorder was found in this patient?

- A. B_{12} -folic-acid-deficiency anemia
- B. Iron deficiency anemia
- C. Myeloid leukemia
- D. Aplastic anemia
- E. Hemolytic anemia

49. Coenzym A participates in numerous important metabolic reactions. It is a derivative of the following vitamin:

- A. Pantothenic acid
- B. Thiamine
- C. Niacin
- D. Calciferol

E. Ubiquinone

50. A doctor recommends a patient with duodenal ulcer to drink cabbage and potato juice after the therapy course. Which substances contained in these vegetables help to heal and prevent the ulcers?

- A. Vitamin *U*
- B. Pantothenic acid
- C. Vitamin *C*
- D. Vitamin *B1*
- E. Vitamin *K*

Fat -soluble vitamins

1. A 2 year old child suffers from intestinal dysbacteriosis that lead to the development hemorrhagic syndrome. The most probable cause of hemorrhage is:
 - A. Vitamin K deficiency
 - B. Activation of tissue thromboplastin
 - C. Hypovitaminosis PP
 - D. Fibrinogen deficiency
 - E. Hypocalcemia

2. Surgery in patients with obstructive jaundice and malabsorption in the intestine complicated by bleeding. What vitamin insufficiency has led to this?
 - A. Vitamin K
 - B. Vitamin B12
 - C. Vitamin C
 - D. Vitamin B6
 - E. Folic acid

3. Hepatic disfunctions accompanied by insufficient in flow of bile to the bowels result in coagulation failure. This phenomenon can be explained by:
 - A. Vitamin K deficiency
 - B. Leucopenia
 - C. Thrombocytopenia
 - D. Erythropenia
 - E. Iron deficiency

4. The function of protein synthesis in the liver due to a lack of vitamin K is reduced in a young man of 16 years after suffering the disease. This can lead to a violation of:
 - A. Blood coagulation
 - B. Erythrocyte sedimentation rate
 - C. Education anticoagulants
 - D. Formation of erythropoietin
 - E. Blood pH

5. In the patient observed hemorrhage, reduced the concentration of prothrombin in the blood. What vitamin deficiency led to a violation of the synthesis of this blood clotting factor?
 - A. K
 - B. A
 - C. D
 - D. C
 - E. E

6. In the patient 37 years against the background of long-term use of antibiotics observed increasing bleeding after small injuries. In the blood - decrease in activity II, VII, X blood clotting factors; lengthening of blood clotting time. What vitamin deficiency are caused by these changes?
 - A. Vitamin K
 - B. Vitamin A
 - C. Vitamin C
 - D. Vitamin D
 - E. Vitamin E

7. Plasma coagulation factors are subject to posttranslational modification with the participation of vitamin K. As a cofactor, it is needed in the γ -carboxylation enzyme system of protein coagulation factors due to an increase in the affinity of their molecules by calcium ions. What amino acid is carboxylated in these proteins?
 - A. Glutamine
 - B. Valin
 - C. Serine
 - D. Phenylalanine
 - E. Arginine

8. A 49-year-old man is observed in the clinic with a significant increase in blood clotting time, gastrointestinal bleeding, subcutaneous hemorrhage. What vitamin deficiency can explain these symptoms?
 - A. K
 - B. B₁
 - C. PP
 - D. H
 - E. E

9. As a result of post-translational modifications of certain proteins involved in blood coagulation, in particular prothrombin, they acquire the ability to bind calcium. In this process participate vitamin
 - A. K
 - B. C
 - C. A
 - D. B₁
 - E. B₂

10. To prevent postoperative bleeding, a 6-year-old child is recommended to take vikasol, which is a synthetic analogue of vitamin K. Specify which post-translational changes of blood clotting factors are activated under the influence of vikasol?
 - A. Carboxylation of glutamic acid

- B. Phosphorylation of serine radicals
- C. Partial proteolysis
- D. Polymerization
- E. Glycosylation

11. In patients with the biliary tract obstruction the blood coagulation is inhibited; the patients have frequent haemorrhages caused by the subnormal assimilation of the following vitamin:

- A. K
- B. A
- C. D
- D. E
- E. C

12. A few days before an operation a patient should be administered vitamin K or its synthetic analogue Vicasol. Vitamin K takes part in the following posttranslational modification of the II, VII, IX, X blood clotting factors:

- A. Carboxylation
- B. Decarboxylation
- C. Deamination
- D. Transamination
- E. Glycosylation

13. A patient, who has been suffering for a long time from intestine disbacteriosis, has increased hemorrhaging caused by disruption of posttranslational modification of blood-coagulation factors II, VII, IX, and X in the liver. What vitamin deficiency is the cause of this condition?

- A. K
- B. B12
- C. B9
- D. C
- E. P

14. 10 month old child has high excitability, sleep disturbance, amyotonia, retarded dentition, teeth erupt with inadequate enamel calcification. These changes are caused by deficiency of the following vitamin:

- A. Cholecalciferol
- B. Riboflavin
- C. Thiamine
- D. Retinol
- E. Nicotinamide

15. In the patient with renal insufficiency has developed osteodystrophy, accompanied by intense bone demineralization. Violation of the formation of which vitamin active form was the cause of this complication?

- A. Calciferol
- B. Retinol
- C. Thiamine
- D. Naphthoquinone
- E. Riboflavin

16. The child has a delayed teething, their wrong arrangement, upon examination noticeable dryness of the oral cavity, in the corners of the mouth there are cracks with suppuration. With the lack of the vitamin this condition may be related?

- A. Vitamin D.
- B. Vitamin C.
- C. Vitamin E.
- D. Vitamin K.
- E. Vitamin A.

17. In a child of the first year of life is observed an increase in the size of the head and abdomen, late teething, violation of the enamel structure. The consequence of vitamin deficiencies are these changes?

- A. Hypovitaminosis D
- B. Hypovitaminosis C
- C. Hypovitaminosis A
- D. Hypovitaminosis B₁
- E. Hypovitaminosis B₂

18. A 6-year-old child suffers from delayed growth, disrupted ossification processes, decalcification of the teeth. What can be the cause?

- A. Vitamin D deficiency
- B. Decreased glucagon production
- C. Insulin deficiency
- D. Hyperthyroidism
- E. Vitamin C deficiency

19. A 35-year-old female patient with a chronic renal disease has developed osteoporosis. The cause of this complication is the deficiency of the following substance:

- A. 1,25-dihydroxy-D₃
- B. 25-hydroxy-D₃
- C. D₃
- D. D₂
- E. Cholesterol

20. A child with renal insufficiency exhibits delayed teeth eruption. This is most likely caused by the abnormal formation of the following substance:
- 1,25 (OH)₂D₃
 - Glycocyamine
 - Glutamate
 - α-ketoglutarate
 - Hydroxylysine
21. When examining a child, the doctor revealed signs of rickets. Which compounds insufficiency in the child's body facilitates the development of this disease?
- 1,25 [OH] -dihydroxycholecalciferol
 - Biotin
 - Tocopherol
 - Naphthoquinone
 - Retinol
22. During regular check-up a child is detected with interrupted mineralization of the bones. What vitamin deficiency can be the cause?
- Calciferol
 - Riboflavin
 - Tocopherol
 - Folic acid
 - Cobalamin
23. In patients after gallbladder removal processes are hampered Ca²⁺ absorption through the intestinal wall. What vitamin prescription will stimulate this process?
- D₃
 - RR
 - C
 - B₁₂
 - K
24. A patient who suffers from chronic renal insufficiency fell ill with osteoporosis. Disturbed synthesis of what mineral metabolism's regulator is the cause of osteoporosis?
- Formation of 1, 25(OH)₂D₃
 - Proline hydroxylation
 - Lysine hydroxylation
 - Glutamate carboxylation
 - Cortisol hydroxylation
25. A patient has enamel erosion. What vitamin should be administered for its treatment?
- D₃
 - C
 - K
 - B₁
 - PP
26. A 5 years old child has insufficient calcification of enamel, tooth decay. Which vitamin hypovitaminosis leads to the development of this process?
- Calciferol
 - Tocopherol
 - Biotin
 - Nicotinic acid
 - Folic acid
27. On examination of 11 months' child, the pediatrician found a curvature of the bones of the lower extremities and a delay in the mineralization of the bones of the skull. What vitamin deficiency leads to this pathology?
- Cholecalciferol
 - Thiamine
 - Pantothenic acid
 - Bioflavonoids
 - Riboflavin
28. A child with signs of rickets has been prescribed a certain liposoluble vitamin drug by pediatrician and dentist. This drug affects the metabolism of phosphorus and calcium in the body and facilitates calcium accumulation in bone tissue and dentine. If its content in the body is insufficient, there develop disruptions of ossification process, dental structure and occlusion. Name this drug:
- Ergocalciferol
 - Retinolacetate
 - Tocopherolacetate
 - Menadione (Vicasolum)
 - Thyroidin
29. Hormonal form of a certain vitamin induces genome level synthesis of Ca binding proteins and enterocytes thus regulating the intestinal absorption of Ca²⁺ ions required for dental tissue development. What vitamin is it?
- D₃
 - A
 - B₁
 - E
 - K

30. A 4-year-old child with hereditary renal lesion has signs of rickets; vitamin D concentration in blood is normal. What is the most probable cause of rickets development?
- Impaired synthesis of calcitriol
 - Increased excretion of calcium
 - Hyperfunction of parathyroid glands
 - Hypofunction of parathyroid glands
 - Lack of calcium in food
31. Vitamin A together with specific cytochrome receptors penetrates through the nuclear membranes, induces transcription processes that stimulate growth and differentiation of cells. This biological function is realized by the following form of vitamin A:
- Trans-retinoic acid
 - Carotin
 - Cis-retinal
 - Retinol
 - Trans-retinal
32. A patient suffers from vision impairment-hemeralopia (night blindness). What vitamin preparation should be administered to the patient in order to restore his vision?
- Retinol acetate
 - Vicasol
 - Pyridoxine
 - Thiamine chloride
 - Tocopherol acetate
33. An oculist detected increased time of darkness adaptation of a patient's eye. What vitamin deficiency can cause such a symptom?
- A
 - E
 - C
 - K
 - D
34. A patient complains of photoreception disorder and frequent acute viral diseases. He has been prescribed a vitamin that affects photoreception processes by producing rhodopsin, the photosensitive pigment. What vitamin is it?
- Retinol acetate
 - Tocopherol acetate
 - Pyridoxine hydrochloride
 - Cyanocobalamin
 - Thiamine
35. In order to accelerate healing of a radiation ulcer a vitamin drug was administered. What drug is it?
- Retinol acetate
 - Retabolil
 - Prednisolone
 - Levamisole
 - Methyluracil
36. While the examination of patient's oral cavity the dentist found xerostomia, numerous erosions. What vitamin deficit caused this effect?
- Vitamin A
 - Vitamin K
 - Vitamin P
 - Vitamin H
 - Vitamin PP
37. In order to prevent gum inflammation and to improve regeneration of epithelial periodontium cells manufacturers add to the tooth pastes one of the following vitamins:
- Retinol
 - Calciferol
 - Thiamine
 - Biotin
 - Phyloquinone
38. A 64 year old woman has impairment of twilight vision (hemeralopia). What vitamin should be recommended in the first place?
- A
 - B₂
 - E
 - C
 - B₆
39. The patient has worsened twilight vision. Which of the vitamin preparations should be prescribed to the patient?
- Retinol acetate
 - Cyanocobalamin
 - Pyridoxine hydrochloride
 - Ascorbic acid
 - Nicotinic acid
40. The patient with periodontal disease was prescribed a fat-soluble vitamin preparation, which is actively involved in the redox processes in the body. Antioxidant is a growth factor, antixerophthalmic, provides normal vision. In dental practice it is used to accelerate

epithelization in case of mucosal diseases with periodontitis. Identify this drug:

- A. Retinol acetate
- B. Ergocalciferol
- C. Tocopherol acetate
- D. Vikasol
- E. Cyanocobalamin

41. A patient has the following changes: disorder of twilight vision, drying out of conjunctiva and cornea. Such disorders may be caused by deficiency of vitamin:

- A. Vitamin A
- B. Vitamin B
- C. Vitamin C
- D. Vitamin D
- E. Vitamin B12

42. A patient complains of photoreception disorder and frequent acute viral diseases. He has been prescribed a vitamin that affects photoreception processes by producing rhodopsin, the photosensitive pigment. What vitamin is it?

- A. Retinol acetate
- B. Tocopherol acetate
- C. Pyridoxine hydrochloride
- D. Cyanocobalamin
- E. Thiamine

43. There are various diseases that cause sharp increase of active oxygen, leading to cell membranes destruction. Antioxidants are used to prevent it from happening. The most potent natural antioxidant is:

- A. Alpha-tocopherol
- B. Glycerol
- C. Vitamin D
- D. Fatty acids
- E. Glucose

44. A pregnant woman with several miscarriages in anamnesis is prescribed a therapy that includes vitamin preparations. What vitamin facilitates carrying of a pregnancy?

- A. Alpha-tocopherol
- B. Folic acid
- C. Cyanocobalamin
- D. Pyridoxal phosphate
- E. Rutin

45. Parodontosis is treated by means of antioxidants. Which of the following natural compounds is used as an antioxidant:

- A. Tocopherol
- B. Thiamine
- C. Gluconate
- D. Pyridoxine
- E. Choline

46. When treating sialadenitis (inflammation of the salivary glands), preparations of vitamins are used. Which of the following vitamins plays an important role in antioxidant defense?

- A. Tocopherol
- B. Pantothenic acid
- C. Riboflavin
- D. Thiamine
- E. Pyridoxine

47. A woman, who had undergone mastectomy due to breast cancer, was prescribed a course of radiation therapy. What vitamin preparation has marked antiradiation effect due to its antioxidant activity?

- A. Tocopherol acetate
- B. Ergocalciferol
- C. Riboflavin
- D. Cyanocobalamin
- E. Folic acid

48. What vitamin deficiency leads to both disorder of reproductive function and dystrophy of skeletal muscles?

- A. Vitamin E
- B. Vitamin A
- C. Vitamin K
- D. Vitamin D
- E. Vitamin B1

49. Ionizing radiation or vitamin E deficiency affect the cell by increasing lysosomal membrane permeability. What are the possible consequences of this pathology?

- A. Partial or complete cell destruction
- B. Intensive protein synthesis
- C. Intensive energy production
- D. Restoration of cytoplasmic membrane
- E. Formation of maturation spindle

50. Examination of a man who hadn't been consuming fats but had been getting enough carbohydrates and proteins for a long time revealed dermatitis, poor wound healing, vision impairment. What is the probable cause of metabolic disorder?

- A. Lack of linoleic acid, vitamins A, D, E, K
- B. Lack of palmitic acid

- C. Lack of vitamins *PP, H*
- D. Low caloric value of diet
- E. Lack of oleic acid

51. For the prevention of atherosclerosis, coronary heart disease, cerebrovascular accident, the consumption of high-fat polyunsaturated fatty acids is recommended. One of the following fatty acids is:

- A. Linolic
- B. Oleic
- C. Lauric
- D. Palmitooleic
- E. Stearic

Basic laws of metabolism and energy

1. The Krebs cycle plays an important role in the realization of the glucoplastic effect of amino acids. This is due to the mandatory transformation of a nitrogen-free residue into:
 - A. Oxaloacetate.
 - B. Malate.
 - C. Succinate.
 - D. Fumarat.
 - E. Citrate.
2. At the patient of 57 years, suffering from a diabetes, the keto-acidosis has developed. The biochemical basis of this condition is a decrease in the degree of utilization of acetyl-CoA. The disadvantage of which is the connection in cells that is due?
 - A. Oxaloacetate
 - B. 2-oxoglutarate
 - C. Glutamate
 - D. Aspartate
 - E. Succinate
3. During the oxidation of carbohydrates, lipids, a large amount of energy is formed, the bulk of which is formed due to the oxidation of acetyl-CoA. How many ATP molecules are formed when a single molecule of acetyl-CoA is completely oxidized?
 - A. 12.
 - B. 8.
 - C. 38.
 - D. 24.
 - E. 36
4. Prussic acid and cyanide are among the strongest poisons. Depending on the dose, death occurs in a few seconds or minutes. The inhibition of the activity of which enzyme is the cause of death?
 - A. Cytochrome oxidase.
 - B. Acetyl holinesesterase.
 - C. Catalase.
 - D. Methemoglobin reductase.
 - E. ATP synthetases.
5. Cyanide poisoning causes immediate death. What is the mechanism of cyanide effect at the molecular level?
 - A. They inhibit cytochromoxidase
 - B. They bind substrates of tricarboxylic acid cycle
 - C. They block succinate dehydrogenase
 - D. They inactivate oxygene
 - E. They inhibit cytochrome B
6. A patient with poisoning with an insecticide- rotenone was taken to the hospital. Which part of the mitochondrial electron transfer chain is blocked by this substance?
 - A. NADH coenzyme Q-reductase.
 - B. ATP synthetases.
 - C. Coenzyme Q-cytochrome C-reductase.
 - D. Succinate-coenzyme Q-reductase.
 - E. Cytochrome C-oxidase.
7. Rotenone is known to inhibit respiratory chain. What complex of mitochondrial respiratory chain is inhibited by this substance?
 - A. NADH-coenzymeQreductase
 - B. Cytochromeoxidase
 - C. CoenzymeQ-cytochromecreductase
 - D. Succinate-coenzyme Qreductase
 - E. Adenosine triphosphate synthetase
8. In the intensive care unit in a serious condition, unconscious, the patient was admitted. Diagnosed overdose of barbiturates, which caused the phenomenon of tissue hypoxia. At what level was blocking the electron transport?
 - A. NADH-Coenzyme-Q-reductase
 - B. Cytochrome oxidase
 - C. Cytochrome b - cytochrome c1
 - D. Ubiquinone
 - E. ATP synthase
9. Hyperthermia, bulimia, weight loss, which is observed in patients with thyrotoxicosis, associated with a violation:
 - A. Conjugation of oxidation and phosphorylation.
 - B. Reactions of fat synthesis.
 - C. Decay of ATP.
 - D. Reactions of the citric acid cycle
 - E. Reactions of beta-oxidation of fatty acids.
10. With thyrotoxicosis, the production of thyroid hormones T3 and T4 increases, weight loss develops, tachycardia, mental excitability and so on. The mechanism of their action?
 - A. separates oxidation and oxidative phosphorylation.
 - B. Activate substrate phosphorylation.
 - C. Block the substrate by phosphorylation.
 - D. Block the respiratory chain.
 - E. Oxidative phosphorylation is activated.

11. A woman who is receiving treatment for hyperthyroidism, there is an increase in body temperature. What is the basis of this phenomenon?
- Separation of oxidative phosphorylation
 - Decreased glucose utilization by tissues
 - Reduced fat oxidation in the liver
 - Violation of amino acid deamination
 - Violation of glycogen synthesis
12. A 38-year-old woman complains of increased sweating, heartbeat, and an increase in temperature in the evening. The main exchange is increased by 60%. The doctor diagnosed thyrotoxicosis. What properties of thyroxin lead to increased heat production?
- Separation of oxidative phosphorylation
 - Increases conjugation of oxidation and phosphorylation
 - Reduces β -oxidation of fatty acids
 - Reduces the deamination of amino acids
 - Contributes to the accumulation of acetyl CoA
13. Cells were treated with a substance that blocks the phosphorylation of nucleotides in the mitochondria. The process of cell activity will be violated in the first place?
- Oxidative phosphorylation.
 - Glycolysis.
 - Integration of functional protein molecules.
 - Aerobic oxidation of glucose
 - Synthesis of mitochondria proteins.
14. In the presence of 2,4-dinitrophenol, the oxidation of substrates can continue, but the synthesis of ATP molecules is impossible. What is the mechanism of its action?
- Separation of oxidation and phosphorylation in mitochondria
 - Activation of the enzyme ATPase
 - Transfer of substrates beyond mitochondria
 - Stimulation of hydrolysis of formed ATP
 - Inhibition of the enzyme cytochrome oxidase
15. Researches of the latest decades established that immediate "executors" of cell apoptosis are special enzymes called caspases. Generation of one of them proceeds with participation of cytochrome C. What is its function in a normal cell?
- Enzyme of respiratory chain of electrontransport
 - Enzyme of tricarboxylic acid cycle
 - Enzyme of beta-oxidation of fatty acids
 - Component of H^+ -ATP system
 - Component of pyruvate-dehydrogenasesystem
16. Cyanide is a poison that causes instant death of the organism. What enzymes found in mitochondria are affected by cyanide?
- Cytochrome oxidase (aa3)
 - Flavin enzymes
 - Cytochrome 5
 - NAD⁺-dependent dehydrogenase
 - Cytochrome P-450
17. Hydrocyanic acid and cyanides are the most violent poisons. According to the dose the death follows after a few seconds or minutes. The death is caused by the inhibited activity of the following enzyme:
- Cytochrome oxidase
 - Acetylcholinesterase
 - ATP-synthetase
 - Catalase
 - Methemoglobin reductase
18. Potassium cyanide that is a poison came into a patient's organism and caused death a few minutes after it. The most probable cause of its toxic effect was abnormal activity of:
- Cytochrome oxidase
 - Catalase
 - ATP-synthetase
 - NADP – H-dehydrogenase
 - Haemoglobin synthesis
19. The resuscitation unit has admitted a patient in grave condition. It is known that he had mistakenly taken sodium fluoride which blocks cytochrome oxidase. What type of hypoxia developed in the patient?
- Tissue
 - Hemic
 - Cardiovascular
 - Hypoxic
 - Respiratory

Carbohydrate metabolism and its regulation

1. In a patient of 60 years the activity of the main digestive enzyme of saliva is reduced. In this case, the primary hydrolysis of which organic compounds is disturbed?
 - A. Carbohydrates.
 - B. Fats.
 - C. Proteins.
 - D. Cellulose.
 - E. Lactose.
2. With age, the activity of the parotid glands decreases. The activity of what enzyme of carbohydrate metabolism will decrease?
 - A. Amilase.
 - B. Lysozyme.
 - C. Phosphatase.
 - D. Hexokinase.
 - E. Maltase.
3. A newborn develops dyspepsia after the milk feeding. When the milk is substituted by the glucose solution the dyspepsia symptoms disappear. The newborn has the subnormal activity of the following enzyme:
 - A. Lactase
 - B. Invertase
 - C. Maltase
 - D. Amylase
 - E. Isomaltase
4. While determining power inputs of a patient's organism it was established that the respiratory coefficient equaled 1,0. This means that in the cells of the patient the following substances are mainly oxidized:
 - A. Carbohydrates
 - B. Proteins
 - C. Fats
 - D. Proteins and carbohydrates
 - E. Carbohydrates and fats
5. After the transition to a mixed diet in a newborn child has arisen dyspepsia with diarrhea, meteorism developmental delay. The biochemical basis of this pathology is insufficiency of:
 - A. Saccharase and isomaltase.
 - B. Lactase and cellobiase.
 - C. Trypsin and chymotrypsin.
 - D. Lipase and creatine kinase.
 - E. Cellulase.
6. Analysis of a patient's saliva revealed high concentration of lactate. This is most probably caused by activation of the following process:
 - A. Anaerobic glucose breakdown
 - B. Aerobic glucose breakdown
 - C. Glycogen breakdown
 - D. Carbohydrate hydrolysis
 - E. Glucose-lactate cycle
7. Clinical examination enabled to make a provisional diagnosis: stomach cancer. Gastric juice contained lactic acid. What type of glucose catabolism turns up in the cancerous cells?
 - A. Anaerobic glycolysis
 - B. Pentose-phosphate cycle
 - C. Gluconeogenesis
 - D. Aerobic glycolysis
 - E. Glucose-alanine cycle
8. What process provides erythrocytes with the required amount of energy in the form of ATP for their vital activity?
 - A. Glycolysis.
 - B. Aerobic oxidation of glucose.
 - C. β -Oxidation of fatty acids.
 - D. Pentose phosphate cycle.
 - E. Tricarboxylic acid cycle.
9. Human red blood cells do not contain mitochondria. What is the main pathway for ATP production in these cells?
 - A. Anaerobic glycolysis
 - B. Aerobic glycolysis
 - C. Oxidative phosphorylation
 - D. Creatine kinase reaction
 - E. Cyclase reaction
10. During consumption of biscuits, sweets in the mixed saliva temporarily increases the level of lactate. The activation of which biochemical process leads to this?
 - A. Anaerobic glycolysis
 - B. Tissue breathing
 - C. Aerobic glycolysis
 - D. Gluconeogenesis
 - E. Microsomal oxidation
11. During long-distance running, skeletal muscle of a trained person uses glucose to obtain the energy of ATP for muscle contraction. Indicate the main process of utilization of glucose in these conditions:
 - A. Aerobic glycolysis

- B. Anaerobic glycolysis
- C. Glycogenolysis
- D. Gluconeogenesis
- E. Glycogenesis

12. After restoration of blood circulation in damaged tissue accumulation of lactate comes to a stop and speed of glucose consumption slows down. These metabolic changes are caused by activation of the following process:

- A. Aerobic glycolysis
- B. Anaerobic glycolysis
- C. Lipolysis
- D. Gluconeogenesis
- E. Glycogen biosynthesis

13. When blood circulation in the damaged tissue is restored, then lactate accumulation comes to a stop and glucose consumption decelerates. These metabolic changes are caused by activation of the following process:

- A. Aerobic glycolysis
- B. Anaerobic glycolysis
- C. Lipolysis
- D. Gluconeogenesis
- E. Glycogen biosynthesis

14. A 32-year-old female patient suffers from gingivitis accompanied by gum hypoxia. What metabolite of carbohydrate metabolism is produced in the periodontium tissues more actively in this case?

- A. Lactate
- B. Ribose 5-phosphate
- C. Glycogen
- D. Glucose 6-phosphate
- E. NADPH-H

15. Untrained people often have muscle pain after sprints as a result of lactate accumulation. This might be caused by intensification of the following biochemical process:

- A. Glycolysis
- B. Gluconeogenesis
- C. Pentose phosphate pathway
- D. Lipogenesis
- E. Glycogenesis

16. Anaerobic splitting of glucose to lactic acid is regulated by the relevant enzymes. What enzyme is the main regulator of this process?

- A. Phosphofruktokinase
- B. Glucose-6-phosphate isomerase
- C. Aldolase

- D. Enolase
- E. Lactate dehydrogenase

17. Cytoplasm of the myocytes contains a lot of dissolved metabolites resulting from glucose oxidation. Name the metabolite that turns directly into lactate:

- A. Pyruvate
- B. Oxaloacetate
- C. Glycerophosphate
- D. Glucose-6-phosphate
- E. Fructose-6-phosphate

18. Treatment of many diseases involves use of cocarboxylase (thiamine pyrophosphate) for supplying cells with energy. What metabolic process is activated in this case?

- A. Oxidizing decarboxylation of pyruvate
- B. Glutamate deamination
- C. Amino acids decarboxylation
- D. Decarboxylation of biogenic amines
- E. Detoxication of harmful substances in liver

19. A worker of a chemical enterprise was taken to the hospital with signs of poisoning. In the hair of this woman found increased concentration of arsenate, which blocks lipoic acid. Violation of which process is the most likely cause of poisoning?

- A. Oxidation decarboxylation of pyruvate.
- B. Microsomal oxidation.
- C. Restoration of methemoglobin.
- D. Restoration of organic peroxides.
- E. Removal of superoxide ions.

20. Oxidative decarboxylation of pyruvic acid is catalyzed by a multienzyme complex with several functionally linked coenzymes. Name this complex:

- A. Thymidine diphosphate (TDP), flavin adenine dinucleotide (FAD), coenzyme A (CoASH), nicotine amide adenine dinucleotide (NAD), lipoic acid
- B. Flavin adenine dinucleotide (FAD), tetrahydrofolic acid, pyridoxal-5-phosphate, thymidine diphosphate (TDP), choline
- C. Nicotine amide adenine dinucleotide (NAD), pyridoxal-5-phosphate, thymidine diphosphate (TDP), methylcobalamin, biotin
- D. Coenzyme A (CoASH), flavin adenine dinucleotide (FAD), pyridoxal-5-phosphate, tetrahydrofolic acid, carnitine
- E. Lipoic acid, tetrahydrofolic acid, pyridoxal-5-phosphate, methylcobalamin

21. It has been found out that one of pesticide components is sodium arsenate that blocks lipoic acid. Which enzyme activity is impaired by this pesticide?
- Pyruvate dehydrogenase complex
 - Microsomal oxidation
 - Methemoglobin reductase
 - Glutathione peroxidase
 - Glutathione reductase
22. In erythrocytes of the patient with hemolytic anemia, the activity of pyruvate kinase was significantly reduced. What metabolic process is violated under these conditions?
- Glycolysis
 - Glycogenolysis
 - Gluconeogenesis
 - Pentose phosphate pathway of glucose oxidation
 - Synthesis of glycogen
23. Decreased ratio of adenyl nucleotides ATP/ADP results in intensified glycolysis in parodontium tissues under hypoxia conditions. What reaction is activated in this case?
- Phosphofruktokinase
 - Aldolase
 - Triose phosphate isomerase
 - Enolase
 - Lactate dehydrogenase
24. In some anaerobic bacteria the pyruvate produced by glycolysis is converted to the ethyl alcohol (alcoholic fermentation). What is the biological significance of this process?
- NAD⁺ replenishment
 - Lactate production
 - ADP production
 - Providing the cells with NADPH
 - ATP production
25. In medical practice for prevention of alcoholism, a drug that is an aldehyde dehydrogenase inhibitor is widely used. The increase of which metabolite in the blood causes disgust to alcohol?
- Acetaldehyde
 - Ethanol
 - Malone aldehyde
 - Propionic aldehyde
 - Methanol
26. The patient during the course of treatment with a drug that blocks alcohol dehydrogenase, consumed a small amount of alcohol, resulting in severe poisoning. Explain the cause of poisoning:
- Accumulation of acetaldehyde
 - Allergic reaction
 - Neuralgia disorders
 - Cardiovascular insufficiency
 - Violation of the function of the kidneys
27. The biosynthesis of the purine ring occurs on ribose-5-phosphate by gradual build-up of nitrogen and carbon atoms and the closure of the rings. The source of ribose-5-phosphate is the following process:
- Pentose phosphate cycle
 - Glycolysis
 - Gluconeogenesis
 - Gluconeogenesis
 - Glycogenolysis
28. Due to the long-term use of sulfanilamide drugs in a young woman appeared signs of hemolytic anemia due to hereditary violation of the synthesis of the enzyme pentose phosphate pathway glucose-6-phosphate dehydrogenase, which provides formation in the body:
- NADPH.
 - ATP.
 - NAD
 - FAD
 - FMN.
29. 22 year old woman has been taking sulfanilamides for a long time that led to symptoms of hemolytic anaemia caused by hereditary disturbance of synthesis of glucose 6-phosphate dehydrogenase. This enzyme of pentose-phosphate cycle is responsible for generation of:
- $NADP - H_2$
 - NAD
 - FAD
 - FMN
 - ATP
30. Sulfanilamides are applied as antimicrobial agents in clinical practice. Sulfanilamide treatment, however, can result in hemolytic anemia development in patients that suffer from genetic defect of the following enzyme of pentose phosphate metabolism in erythrocytes:
- Glucose-6-phosphate dehydrogenase
 - Hexokinase
 - Transketolase

- D. Transaldolase
- E. Pyruvatekinase

31. 38 year old patient takes aspirin and sulfanilamides. After their intake intensified erythrocyte haemolysis is observed which is caused by deficiency of glucose 6-phosphate dehydrogenase. This pathology is caused by failure of the following coenzyme:

- A. *NADP – H*
- B. *FAD – H₂*
- C. *Pyridoxal phosphate*
- D. *FMN – H₂*
- E. *Ubiquinone*

32. The patient has a chronic inflammatory process of the tonsils. Due to the what biochemical process in the inflammation centers, the concentration of NADPH, which is necessary for the implementation of the mechanism of phagocytosis, is maintained?

- A. Pentose phosphate pathway
- B. Cori Cycle
- C. Krebs cycle
- D. Ornithine cycle
- E. Glycolysis

33. A 7-year-old child has symptoms of hemolytic anemia. In the biochemical analysis of erythrocytes, a reduced concentration of NADPH and reduced glutathione has been established. The deficiency of which enzyme in this case causes biochemical changes and clinical manifestations?

- A. Glucose-6-phosphate dehydrogenase
- B. Hexokinase
- C. Fructokinase
- D. Pyruvate kinase
- E. Lactate dehydrogenase

34. A child's blood presents high content of galactose, glucose concentration is low. There are such presentations as cataract, mental deficiency, adipose degeneration of liver. What disease is it?

- A. Galactosemia
- B. Diabetes mellitus
- C. Lactosemia
- D. Steroid diabetes
- E. Fructosemia

35. A sick child has a delayed mental development, enlarged liver, and decreased vision. The physician binds these symptoms to

deficiency in the galactose-1-phosphate uridylyltransferase. What is the pathological process in the child?

- A. Galactosaemia
- B. Fructosemia
- C. Hyperglycemia
- D. Hypoglycemia
- E. Hyperlactate acidemia

36. In the 2-year-old boy, an increase in the size of the liver and spleen, cataract is observed. The concentration of sugar is elevated in the blood, but the test of glucose tolerance is normal. An hereditary violation of the metabolism of which substance is the cause of this condition?

- A. Galactose
- B. Fructose
- C. Glucose
- D. Maltose
- E. Saccharose

37. Indicate, hereditary insufficiency of which enzyme is the cause of vomiting and diarrhea after taking the fruit juices in a 9-month-old child whose fructose intake has led to hypoglycemia?

- A. Fructose-1-phosphataldolase.
- B. Phosphofructokinase
- C. Hexokinase.
- D. Fructose-1,6-diphosphatase.
- E. Fructokinase.

38. In the 8-month-old child, vomiting and diarrhea are observed after taking fruit juices. Fructose intake led to hypoglycemia. Hereditary insufficiency of which enzyme is the cause of these disorders?

- A. Fructose-1-phosphataldolase
- B. Fructokinase
- C. Hexokinase
- D. Phosphofructokinase
- E. Fructose-1,6-diphosphatase

39. The excess concentration of glucose in the oral solution in diabetes leads to development:

- A. Multiple caries
- B. Hyperplasia of enamel
- C. Hypoplasia of enamel
- D. Fluorosis
- E. Intensified calcification of enamel

40. In the biochemical study of the patient's blood, hyperglycemia, hyperketonemia, glucose and ketone bodies in urine were detected. On

the electrocardiogram diffuse changes in the myocardium was detected. She complains of dry mouth, thirst, frequent urination, general weakness. The patient suffers from:

- A. Diabetes mellitus.
- B. Alimentary hyperglycemia.
- C. Acute pancreatitis.
- D. Ischemic heart disease.
- E. Non-diabetes mellitus.

41. A 42 year old woman diagnosed with diabetes mellitus was admitted the endocrinological department with complaints of thirst, excessive appetite. What pathological components are revealed in course of laboratory examination of the patient's urine?

- A. Glucose, ketone bodies
- B. Protein, aminoacids
- C. Protein, creatine
- D. Bilirubin, urobilin
- E. Blood

42. A patient with insulin-dependent diabetes mellitus has been injected with insulin. After some time at the patient has developed weakness, irritability, and increased sweating. What is the main mechanism of development of hypoglycemic coma?

- A. Carbohydrate starvation of the brain.
- B. Decrease of gluconeogenesis.
- C. Increase of glycogenolysis.
- D. Increase of ketogenesis.
- E. Increase of lipogenesis.

43. Examination of a 56-year-old female patient with a history of type 1 diabetes revealed a disorder of protein metabolism that is manifested by aminoacidemia in the laboratory blood test values, and clinically by the delayed wound healing and decreased synthesis of antibodies. Which of the following mechanisms causes the development of aminoacidemia?

- A. Increased proteolysis
- B. Albuminosis
- C. Decrease in the concentration of amino acids in blood
- D. Increase in the oncotic pressure in the blood plasma
- E. Increase in low-density lipoprotein level

44. It is known that in patients with diabetes mellitus often found inflammatory processes, reduced regeneration, and healing of wounds decreases. The reason for this is:

- A. Decrease of proteosynthesis
- B. Increase of lipolysis
- C. Acceleration of gluconeogenesis
- D. Reduction of lipolysis
- E. Increase of catabolism

45. Diabetes mellitus causes ketosis as a result of activated oxidation of fatty acids. What disorders of acid-base equilibrium may be caused by excessive accumulation of ketone bodies in blood?

- A. Metabolic acidosis
- B. Metabolic alkalosis
- C. Any changes won't happen
- D. Respiratory acidosis
- E. Respiratory alkalosis

46. A patient is ill with diabetes mellitus that is accompanied by hyperglycemia of over 7,2 millimole/l on an empty stomach. The level of what blood plasma protein allows to estimate the glycemia rate retrospectively (4-8 weeks before examination)?

- A. Glycated hemoglobin
- B. Albumin
- C. Fibrinogen
- D. C-reactive protein
- E. Ceruloplasmin

47. A 62-year-old female patient has developed a cataract (lenticular opacity) secondary to the diabetes mellitus. What type of protein modification is observed in case of diabetic cataract?

- A. Glycosylation
- B. Phosphorylation
- C. ADP-ribosylation
- D. Methylation
- E. Limited proteolysis

48. After recovering from epidemic parotiditis a patient began to put off weight, he was permanently thirsty, drank a lot of water, had frequent urination, voracious appetite. Now he has complaints of skin itch, weakness, furunculosis. His blood contains: glucose - 16 mmole/L, ketone bodies - 100 mcmmole/L; glucosuria. What disease has developed?

- A. Insulin-dependent diabetes
- B. Insulin-independent diabetes
- C. Steroid diabetes
- D. Diabetes insipidus
- E. Malnutrition diabetes

49. Patient with diabetes mellitus experienced loss of consciousness and convulsions after an injection of insulin. What might be the result of biochemical blood analysis for concentration of sugar?
- 1,5 mmol/L
 - 8,0 mmol/L
 - 10,0 mmol/L
 - 3,3 mmol/L
 - 5,5 mmol/L
50. A 46-year-old patient complains of dry mouth, thirst, urination, general weakness. In the blood: hyperglycemia, hyperketonemia. In the urine: glucose, ketone body. On the ECG: diffuse changes in myocardium. What is the most probable diagnosis?
- Diabetes mellitus
 - Alimentary hyperglycemia
 - Acute pancreatitis
 - Non-diabetes mellitus
 - Ischaemic heart disease
51. After the epidemic parotitis, the patient loses weight, constantly feels thirst, drinks a lot of water, indicates frequent urination, increased appetite, itching, weakness, furunculosis. In the blood: glucose - 16 mmol/l, ketone bodies - 100 μ mol/l; glucosuria. What disease has developed in the patient?
- Insulin-dependent diabetes mellitus
 - Non-dependent diabetes mellitus
 - Steroidal diabetes
 - Non-diabetes mellitus
 - Malnutrition-related diabetes mellitus
52. A 38-year-old patient was delivered to the reanimation unit with unconscious. Reflexes are absent. Blood sugar is 2.1 mmol/L. In anamnesis - diabetes since 18 years of age. What coma does a patient have?
- Hypoglycemic
 - Ketoacidotic
 - Lactacidotic
 - Hyperosmolar
 - Hyperglycemic
53. In the patient's blood, glucose is 5.6 mmol/L, 1 hour after the sugar intake - 13.8 mmol/l, and after 3 hours - 9.2 mmol/l. What pathology is characterized by such indicators?
- Hidden form of diabetes mellitus
 - Healthy person
 - Thyrotoxicosis
 - Itsenko-Kushing's disease
 - Akromegalia
54. In a patient 15 years of age, glucose concentration is 4,8 mmol/l, an hour after the sugar intake - 9.0 mmol/l, after 2 hours - 7.0 mmol/l, after 3 hours - 4.8 mmol/l. These indices are characteristic of such a disease:
- Hidden diabetes mellitus
 - Type I diabetes
 - Type II diabetes
 - Itsenko-Kushing's disease
 -
55. A nurse accidentally injected a nearly double dose of insulin to a patient with diabetes mellitus. The patient lapsed into a hypoglycemic coma. What drug should be injected in order to help him out of coma?
- Glucose
 - Lidase
 - Insulin
 - Somatotropin
 - Noradrenaline
56. For type II diabetes, the characteristic features are hyperglycemia, hypochloremia. Which of the following processes is activated in the first place?
- Gluconeogenesis.
 - Glycolysis.
 - Glycogenolysis.
 - Glucose reabsorption.
 - Transport of glucose to the cell.
57. A 57 year old patient with diabetes mellitus was developed ketoacidosis. Biochemical base of this condition is smaller extent of acetyl-CoA utilization. What cell compound deficit causes this effect?
- Oxaloacetate
 - 2-oxoglutarate
 - Glutamate
 - Aspartate
 - Succinate
58. A patient with diagnose of diabetes mellitus, in the morning received an assigned dose of insulin of prolonged action. He missed the next meal, and soon felt weakness, headache, dizziness, greediness, trembling of the body, convulsions, hunger, and the phenomenon of hypoglycemia. The use of glucose does not

improve the condition. What drug should be entered to alleviate this condition?

- A. Adrenaline
- B. Triamcinolone
- C. Noradrenaline
- D. Prednisolone
- E. Hydrocortisone

59. A patient for 5 years suffering from diabetes. As a result of a violation of a diet, he developed a coma. An ambulance doctor gave him glucose. The condition of the patient has improved. What kind of coma was in the patient?

- A. Hypoglycemic
- B. Acidotic
- C. Hyperglycemic
- D. Hepatic
- E. Hypothyroid

60. Patients with Itsenko-Cushing's syndrome are observed with a hyperglycemia and glucosuria. Synthesis and secretion of which hormone is increased in this patient?

- A. Cortisol
- B. Adrenaline
- C. Glucagone
- D. Thyroxine
- E. Aldosterone

61. Pancreas is known as a mixed gland. Endocrine functions include production of insulin by beta cells. This hormone affects the metabolism of carbohydrates. What is its effect upon the activity of glycogen phosphorylase (GP) and glycogen synthase (GS)?

- A. It inhibits GP and activates GS
- B. It activates both GP and GS
- C. It inhibits both GP and GS
- D. It activates GP and inhibits GS
- E. It does not affect the activity of GP and GS

62. Medical ambulance delivered a 2 year old girl to the children's department. Objectively: the child is languid, apathetic. Liver is enlarged and liver biopsy revealed a significant excess of glycogene. Glucose concentration in the blood stream is below normal. What is the cause of low glucose concentration?

- A. Low (absent) activity of glycogene phosphorylase in liver
- B. Low (absent) activity of hexokinase
- C. High activity of glycogen synthetase

D. Low (absent) activity of glucose 6-phosphatase

E. Deficit of a gene that is responsible for synthesis of glucose 1-phosphaturidine transferase

63. After the introduction of adrenaline in a patient with persistent hypoglycemia, blood test has not changed significantly. In such circumstances, there is a possibility of disturbances in the liver. What function of the liver is changed?

- A. Glycogendeposing.
- B. Glycolytic.
- C. Excretory.
- D. Ketogenic.
- E. Cholesterol-forming.

64. A 2-year-old child has been diagnosed with Girke's disease, which is manifested by severe hypoglycemia. The reason for this condition is the absence of the enzyme glucose-6-phosphatase. With the violation of which process is this pathology involved?

- A. Mobilization of glycogen.
- B. Gluconeogenesis.
- C. Glycolysis.
- D. Ketogenesis.
- E. Synthesis of glycogen.

65. The glycogen that came from the food was digested in the gastrointestinal tract. Which final product was formed as a result of this process?

- A. Glucose
- B. Lactate
- C. Lactose
- D. Galactose
- E. Fructose

66. In the human diet there are a large number of carbohydrates. The number of which structures will increase in cytoplasm of hepatocytes?

- A. Glycogen granules
- B. Drops of fat
- C. The lysosomes
- D. Free ribosomes
- E. Inclusion of lipofuscine

67. Andersen's disease belongs to a group of hereditary diseases that develop due to the congenital malformation of the synthesis of certain enzymes of glycogenolysis. The

inadequacy of which enzyme is the molecular basis of this glycogenose?

- A. Amilo (1-4 → 1-6) transglycosidases.
- B. Glycogen synthase.
- C. Glucose-6-phosphatase.
- D. Lysosomal glycosidase.
- E. Phosphofructokinase.

68. Characteristic sign of glycogenosis is muscle pain during physical work. Blood examination reveals usually hypoglycemia. This pathology is caused by congenital deficiency of the following enzyme:

- A. Glycogen phosphorylase
- B. Glucose 6-phosphate dehydrogenase
- C. Alpha amylase
- D. Gamma amylase
- E. Lysosomal glycosidase

69. During starvation normal rate of glucose is maintained by means of activation of gluconeogenesis. What substance can be used as a substrate for this process?

- A. Alanine
- B. Ammonia
- C. Adenine
- D. Urea
- E. Guanine

70. It is known that human carbohydrate reserves rapidly disappear as a result of prolonged fasting. Which of the metabolic processes restores glucose in the blood?

- A. Gluconeogenesis.
- B. Aerobic oxidation of glucose.
- C. Glycolysis.
- D. Glycogenolysis.
- E. Pentose phosphate pathway.

71. Hyperglycemia develops due to chronic overdose of glucocorticoids in a patient. Specify the process of carbohydrate metabolism, due to which the concentration of glucose increases:

- A. Gluconeogenesis.
- B. Aerobic oxidation of glucose.
- C. Glycogenolysis.
- D. Glycogenesis.
- E. Pentose phosphate cycle.

72. During the fasting the muscle proteins break down into free amino acids. In which process will most likely be used amino acids under such conditions?

- A. Gluconeogenesis in the liver.

B. Gluconeogenesis in the muscles.

C. Glycogenolysis.

D. Decarboxylation.

E. Synthesis of higher fatty acids.

73. In a patient undergoing a course of medical starvation, the normal level of glucose in the blood is maintained mainly due to gluconeogenesis. From what amino acids at the same time in the human liver most actively synthesized glucose?

- A. Alanine
- B. Lysine
- C. Valine
- D. Glutamic acid
- E. Leucine

74. The gluconeogenesis is activated in the liver after intensive physical trainings. What substance is utilized in gluconeogenesis first of all in this case:

- A. Lactate
- B. Pyruvate
- C. Glucose
- D. Glutamate
- E. Alanine

75. During intensive physical work, muscle tissue accumulates lactic acid, which diffuses into the blood and is absorbed by the liver and heart. What process ensures the recovery of glycogen stores in the muscles?

- A. Cori Cycle
- B. Citric acid cycle
- C. Ornithine cycle
- D. Cycle of tricarboxylic acids
- E. Pentose phosphate pathway

76. The patient was diagnosed with beri-beri. What is the enzyme's activity affected by the patient?

- A. Pyruvate dehydrogenase.
- B. Citrate synthase.
- C. Malate dehydrogenase.
- D. Succinate dehydrogenase.
- E. Fumarase.

77. If insufficient thiamine - vitamin B1 occurs disease beriberi (polyneuritis) and disturbed carbohydrate metabolism. What metabolite thus accumulates in the blood?

- A. Pyruvate.
- B. Lactate.
- C. Succinate.

- D. Citrate.
- E. Malat.

78. Some students developed myodynia after continuous physical activity during physical education. The reason for such condition was accumulation of lactic acid in the skeletal muscles. It was generated in the students' bodies after activation of the following process:

- A. Glycolysis
- B. Gluconeogenesis
- C. Lipolysis
- D. Pentose-phosphate cycle
- E. Glyconeogenesis

79. It is known that the pentose phosphate pathway occurring in the adipocytes of adipose tissue acts as a cycle. What is the main function of this cycle in the adipose tissue?

- A. NADPH₂ generation
- B. Ribose-phosphate production
- C. Xenobiotic detoxification
- D. Energy generation
- E. Glucose oxidation to end products

80. Fructosuria is known to be connected with inherited deficiency of fructose-1-phosphate aldolase. What product of fructose metabolism will accumulate in the organism resulting in toxic action?

- A. Fructose-1-phosphate
- B. Glucose-1-phosphate
- C. Glucose-6-phosphate
- D. Fructose-1,6-biphosphate
- E. Fructose-6-phosphate

81. The genetic defect of pyruvate carboxylase deficiency is the cause of delayed physical and mental development and early death in children. This defect is characterized by lacticemia, lactaciduria, disorder of a number of metabolic pathways. In particular, the following process is inhibited:

- A. Citric acid cycle and gluconeogenesis
- B. Glycolysis and glycogenolysis
- C. Glycogenesis and glycogenolysis
- D. Lipolysis and lipogenesis
- E. Pentose phosphate pathway and glycolysis

82. Glycogen polysaccharide is synthesized from the active form of glucose. The immediate donor of glucose residues during the glycogenesis is:

- A. UDP-glucose
- B. Glucose-1-phosphate
- C. ADP-glucose
- D. Glucose-6-phosphate
- E. Glucose-3-phosphate

83. A child with point mutation presents with absence of glucose-6-phosphatase, hypoglycemia, and hepatomegaly. What pathology are these signs characteristic of?

- A. Von Gierke's disease (Glycogen storage disease type I)
- B. Cori's disease (Glycogen storage disease type III)
- C. Addison's disease (Primary adrenal insufficiency)
- D. Parkinson's disease
- E. McArdle's disease (Glycogen storage disease type V)

84. A child has a history of hepatomegaly, hypoglycemia, seizures, especially on an empty stomach and in stressful situations. The child is diagnosed with Gierke disease. This disease is caused by the genetic defect of the following enzyme:

- A. Glucose-6-phosphatase
- B. Amyloid-1,6-glycosidase
- C. Phosphoglucomutase
- D. Glycogen phosphorylase
- E. Glucokinase

85. In patients with glycogenosis, that is von Gierke's disease, the conversion of glucose-6-phosphate into glucose is inhibited, which is accompanied by the improper breakdown of glycogen in the liver. The cause of this condition is the following enzyme deficiency:

- A. Glucose-6-phosphatase
- B. Glycogen phosphorylase
- C. Glucose-6-phosphate dehydrogenase
- D. Phosphofructokinase
- E. Phosphoglucomutase

Metabolism of lipids and its regulation

1. Examination of a patient revealed that dental hypoplasia was caused by hypovitaminosis of vitamins *A* and *D*. These vitamins were administered perorally but they didn't have any medicinal effect. What is the probable cause of disturbed vitamin assimilation?
 - A. Bile acid deficiency
 - B. Phospholipase A₂ deficiency
 - C. Cholesterolesterase deficiency
 - D. Colipase deficiency
 - E. Pancreatic lipase deficiency
2. Examination of a man who hadn't been consuming fats but had been getting enough carbohydrates and proteins for long time revealed dermatitis, poor wound healing, vision impairment. What is the probable cause of metabolic disorder?
 - A. Lack of linoleic acid, vitamins *A*, *D*, *E*, *K*
 - B. Lack of palmitic acid
 - C. Lack of vitamins *PP*, *H*
 - D. Low caloric value of diet
 - E. Lack of oleic acid
3. In humans, the absorption of products of the hydrolysis of fats is impaired. The reason for this may be a deficiency in the cavity of the small intestine:
 - A. Bile acids
 - B. Lipolytic enzymes
 - C. Bile pigments
 - D. Sodium ions
 - E. Fat-soluble vitamins
4. A patient has normally colored stool including a large amount of free fatty acids. The reason for this is a disturbance of the following process:
 - A. Fat absorption
 - B. Fat hydrolysis
 - C. Biliary excretion
 - D. Bilification
 - E. Lipase secretion
5. A 65-year-old patient suffers from cholelithiasis. Recently, there were signs of achilic syndrome due to obturation of the biliary tract. Which components of food will be mastered the most?
 - A. Fats
 - B. Carbohydrates
 - C. Proteins
 - D. Nucleic acids
 - E. Electrolytes
6. A patient was prescribed a drug with apparent lipophilic properties. What is the main mechanism of its absorption?
 - A. Passive diffusion
 - B. Active transporting
 - C. Binding with transport proteins
 - D. Pinocytosis
 - E. Filtration
7. Due to the blockage of the common bile duct (which was radiographically confirmed), the biliary flow to the duodenum was stopped. We should expect the impairment of:
 - A. Fat emulsification
 - B. Protein absorption
 - C. Carbohydrate hydrolysis
 - D. Secretion of hydrochloric acid
 - E. Salivation inhibition
8. After eating fatty foods, the patient has nausea and heartburn, steatorrhea occurs. The reason for such a state can be:
 - A. Lack of bile
 - B. Increased lipase secretion
 - C. Violation of trypsin synthesis
 - D. Lack of amylase
 - E. Impaired phospholipase synthesis
9. A coprological study found that the feces are discolored, there are found drops of neutral fat. The most likely cause of this is a violation:
 - A. Flow of bile into the intestine
 - B. pH of gastric juice
 - C. Secretions of pancreatic juice
 - D. Secretion of intestinal juice
 - E. Absorption processes in the intestine
10. The respiratory ratio of the patient is 0.7. This indicates that in human cells prevails:
 - A. Oxidation of fats
 - B. Oxidation of carbohydrates
 - C. Oxidation of proteins
 - D. Mixed oxidation of fats and carbohydrates
 - E. Mixed oxidation of fats and proteins
11. A sportsman was recommended to take a preparation with carnitine in order to improve his achievements. What process is activated by carnitine to the most extent?
 - A. Transporting of fatty acids to the mitochondria

- B. Lipid synthesis
 C. Synthesis of ketone bodies
 D. Synthesis of steroid hormones
 E. Tissue respiration
12. One of the factors that cause obesity is the inhibition of fatty acids oxidation due to:
 A. Low level of carnitine
 B. Impaired phospholipid synthesis
 C. Excessive consumption of fatty foods
 D. Choline deficiency
 E. Lack of carbohydrates in the diet
13. A patient with a high degree of obesity in the quality of a dietary supplement is recommended carnitine to improve the "burning" of fat. What is the direct involvement of carnitine in the process of oxidation of fats?
 A. Transport of fatty acids from cytosol to mitochondria
 B. Activation of fatty acids
 C. Involved in one of the reactions of beta-oxidation of fatty acids
 D. Transport of fatty acids from fat depots to tissues
 E. Activation of intracellular lipolysis
14. A 1-year-old child entered the clinic with signs of damage to the muscles of the extremities and trunk. After the examination revealed a deficit of carnitine in the muscles. The biochemical basis of this pathology is the disruption of the process:
 A. Transport of fatty acids in mitochondria
 B. Regulation of Ca^{2+} level in mitochondria
 C. Substrate phosphorylation
 D. Utilization of lactic acid
 E. Oxidizing phosphorylation
15. Emotional stress causes activation of hormone-sensitive triglyceride lipase in the adipocytes. What secondary mediator takes part in this process?
 A. Cyclic adenosine monophosphate
 B. Cyclic guanosine monophosphate
 C. Adenosine monophosphate
 D. Diacylglycerol
 E. Ions of Ca^{2+}
16. A significant amount of undigested fat was found in the patient's coprogram. The violation of which enzymes secretion most likely occurs in this person?
 A. Pancreatic lipase
 B. Pancreatic amylase
 C. Pancreatic proteases
 D. Bile lipase
 E. Gastric proteases
17. Obesity is a common disease. The aim of its treatment is to lower content of neutral fats in the body. What hormone-sensitive enzyme is the most important for intracellular lipolysis?
 A. Triacylglycerol lipase
 B. Protein kinase
 C. Adenylate cyclase
 D. Diacylglycerol lipase
 E. Monoacylglycerol lipase
18. Disorder the splitting of the lipids in the small intestine is due to a disorder of lipase activity. Which of the following factors activates the lipase?
 A. Bile acids
 B. Hydrochloric acid
 C. Enterokinase
 D. Pepsin
 E. Solts of Na^+
19. A man has 35 years of pheochromocytoma. In the blood there is an elevated level of adrenaline and norepinephrine, the concentration of free fatty acids increased in 11-fold. Indicate which activation of any enzyme under the influence of adrenaline increases lipolysis?
 A. TAG-lipase.
 B. Lipoprotein lipase.
 C. Phospholipases A_2 .
 D. Phospholipase C.
 E. Cholesterol esterase
20. The patient, who was in the clinic about pneumonia complicated by pleurisy, was included in the complex therapy of prednisolone. The anti-inflammatory action of this synthetic glucocorticoid is associated with blocking the release of arachidonic acid by inhibition:
 A. A_2 phospholipases
 B. Lipoxigenase
 C. Phospholipases C.
 D. Peroxidase
 E. Cyclooxygenase
21. In the laboratory examination of blood of a person who was bitten by a change, hemolysis of erythrocytes, hemoglobinuria was revealed.

The action of a mixed poison is due to the presence of an enzyme in it:

- A. Phospholipase A₂
- B. Phospholipase D
- C. Phospholipase S.
- D. Phospholipase A₁
- E. Sphingomyelinase

22. Patients with pain syndrome in the joints permanently appoint aspirin. Which of the enzymes that he enfold?

- A. Phospholipase A₂
- B. Cyclooxygenase
- C. Phospholipase D
- D. Lipoxigenase
- E. Phospholipase C

23. Thromboxanes belong to the bioregulators of cellular functions of lipid nature. The source for the synthesis of these compounds is:

- A. Arachidonic acid
- B. Stearic acid
- C. Palmitic acid
- D. Phosphatidic acid
- E. Palmiotoleic acid

24. Methyl groups (-CH₃) are used in the body for synthesis such important compounds as creatine, choline, adrenaline, and others. The source of these groups is one of the essential amino acids, namely:

- A. Methionine
- B. Valine
- C. Leucine
- D. Isoleucine
- E. Tryptophan

25. At deficiency of biotin, there is a disorder of higher fatty acids synthesis. Which of these metabolites can be affected by this?

- A. Malonyl-CoA
- B. Succinyl-CoA
- C. Pyruvate
- D. Alanine
- E. Serotonin

26. Deficiency in the body of linoleic and linoleic acids leads to skin damage, hair loss, delayed healing of wounds, thrombocytopenia, and reduced probability of infection. Disorders the synthesis of which substances most likely causes these symptoms?

- A. Eicosanoids
- B. Interleukins

- C. Interferons
- D. Catecholamins
- E. Corticosteroids

27. The drug "Geptral", which is used in liver diseases contains S-adenosylmethionine. This active amino acid is involved in the synthesis of:

- A. Phospholipids
- B. Fatty acids
- C. Triacylglycerols
- D. Cholesterol
- E. Heme

28. It is known that a part of carbon dioxide is used in the body in the biosynthesis of fatty acids, urea, gluconeogenesis, and the like. What kind of vitamin forms a CO₂-transporting form for these reactions?

- A. Biotine
- B. Timine
- C. Riboflavin
- D. Nicotinamide
- E. Retinol

29. A young man of 25 years consumes an excessive amount of carbohydrates (600 g per day) that exceeds its energy needs. What process will be activated in the human organism in this case?

- A. Lypogenesis
- B. Glycolysis
- C. Lypolis
- D. Gluconeogenesis
- E. Oxidation of fatty acids

30. Disorders of the processes of mielinisation neuronal fibers' leads to neurological disorders and mental retardation. Such symptoms are characteristic for hereditary and acquired metabolic disturbances:

- A. Sphingolipids
- B. Neutral fat
- C. Higher fatty acids
- D. Cholesterol
- E. Phosphatidic acid

31. The mother asked the doctor about the bad health of the child - the lack of appetite, poor sleep, irritability. At the biochemical examination in the blood, the absence of the enzyme glucocerebrosidase was detected. For which pathology is this characteristic?

- A. Gaucher's disease

- B. Tay-Sachs disease
- C. Niemann-Pick's disease
- D. Gaucher's disease
- E. Pompe's disease

32. A patient is diagnosed with glucocerebrosidosis (Gaucher's disease) that manifests as splenomegaly, liver enlargement, affected bone tissue, and neuropathies. What enzyme of complex lipid catabolism is deficient, thus causing this disease?

- A. Sphingomyelinase
- B. β -galactosidase
- C. Glucocerebrosidase
- D. Hexosaminidase
- E. Hyaluronidase

33. At utilization of arachidonic acid by cyclooxygenase pathways, biologically active substances are formed. Indicate them:

- A. Prostaglandins
- B. Thyroxine
- C. Biogenic amines
- D. Somatomedin
- E. Insulin-like growth factors

34. The patient appointed a lipotropic drug a donor of methyl groups, to prevent a fatty liver dystrophia. This is sensible:

- A. S-Adenosylmethionine
- B. Cholesterol
- C. Bilirubin
- D. Valine
- E. Glucose

35. Steatosis occurs as a result of the accumulation of triacylglycerols in hepatocytes. One of the mechanisms of development of this disease is reduction of utilization neutral fat LDL. What lipotropic substances prevent the development of steatosis?

- A. Methionine, B₆, B₁₂
- B. Arginine, B₂, B₃
- C. Alanine, B₁, PP
- D. Valine, B₃, B₂
- E. Isoleucine, B₁, B₂

36. In an experimental animal, receiving non-protein diet, fatty infiltration of the liver has developed due to the deficiency of the methylating agents. The formation of which metabolite is disturbed in the experimental animal?

- A. Choline
- B. DOPA
- C. Cholesterol
- D. Acetoacetate
- E. Linolic acid

37. Synthesis of phospholipids is disordered under the liver fat infiltration. Indicate which of the following substances can enhance the process of methylation during phospholipids synthesis?

- A. Methionine
- B. Ascorbic acid
- C. Glucose
- D. Glycerin
- E. Citrate

38. Examination of cell culture got from a patient with lysosomal pathology revealed accumulation of great quantity of lipids in the lysosomes. What of the following diseases is this disturbance typical for?

- A. Tay-Sachs disease
- B. Gout
- C. Phenylketonuria
- D. Wilson disease
- E. Galactosemia

39. An experimental animal has been given excessive amount of carbon-labeled glucose for a week. What compound can the label be found in?

- A. Palmitic acid
- B. Methionine
- C. Vitamin A
- D. Choline
- E. Arachidonic acid

40. A 6 years old child was delivered to a hospital. Examination revealed that the child couldn't fix his eyes, didn't keep his eyes on toys, eye ground had the cherry-red spot sign. Laboratory analyses showed that brain, liver and spleen had high rate of ganglioside glycometide. What congenital disease is the child ill with?

- A. Tay-Sachs disease
- B. Wilson's syndrome
- C. Turner's syndrome
- D. Niemann-Pick disease
- E. MacArdle disease

41. A dry cleaner's worker has been found to have hepatic steatosis. This pathology can be caused by the disruption of synthesis of the following substance:
- Phosphatidylcholine
 - Tristearin
 - Urea
 - Phosphatidic acid
 - Cholic acid
42. The key reaction of fatty acid synthesis is production of malonyl-CoA. What metabolite is the source of malonyl-CoA synthesis?
- Acetyl-CoA
 - Succinyl-CoA
 - Acyl-CoA
 - Malonate
 - Citrate
43. A 2-year-old child presents with acute psychomotor retardation, vision and hearing impairment, sharp enlargement of the liver and spleen. The child is diagnosed with hereditary Niemann-Pick disease. What genetic defect is the cause of this disease?
- Sphingomyelinase deficiency
 - Glucose 6-phosphatase deficiency
 - Amylo-1,6-glucosidase deficiency
 - Acid lipase deficiency
 - Xanthine oxidase deficiency
44. A 3-year-old girl with mental retardation has been diagnosed with sphingomyelin lipidosis (Niemann-Pick disease). In this condition synthesis of the following substance is disrupted:
- Sphingomyelinase
 - Glycosyltransferase
 - Sphingosine
 - Ceramides
 - Gangliosides
45. Modern antiatherosclerotic drugs are used for the prevention and treatment of atherosclerosis. Such drugs as gemfibrozil and fenofibrate are inhibiting cholesterol biosynthesis by enzyme digestion:
- β -HMG-reductase
 - Hexokinase
 - Glucose-6-phosphatase
 - Acyltransferase
 - Acyl-CoA-cholesterolacyltransferase
46. The doctor gave the woman a recommendation to continue the low-calorie diet. She decided to get the same amount of calories, but to replace carbohydrates on fats. Which of the following lipoprotein fractions will be elevated as a result of this diet?
- Chylomicrons
 - VLDL
 - LDL
 - LPID
 - HDL
47. For the prevention of atherosclerosis, coronary heart disease, cerebrovascular accident, the consumption of high-fat polyunsaturated fatty acids is recommended. One of the following fatty acids is:
- Linolic
 - Oleic
 - Lauric
 - Palmitooleic
 - Stearic
48. Hereditary hyperlipoproteinemia of type I is due to insufficiency of the lipoprotein lipase. Increasing of which transport forms of lipid in plasma is characteristic even on an empty stomach?
- Lipoproteins of low density
 - Chylomicrons
 - Lipoproteins of very low density
 - High-density lipoproteins
 - Modified lipoproteins
49. After 4 hours taking of fatty food is found that patient blood plasma is muddy. The most probable reason for this state is increasing the concentration in plasma:
- Chylomicrons
 - VLDL
 - LDL
 - Cholesterol
 - Phospholipids
50. In the diseased child is established hyperlipoproteinemia, inherited. Genetic defect of what synthesis enzyme causes this phenomenon?
- Lipoprotein lipase
 - Glycosidase
 - Proteinase
 - Heme synthetase
 - Phenylalanine hydroxylase

51. Rabbits were fed with cholesterol supplementation. After 5 months, atherosclerotic changes were detected in the aorta. Name the main cause of atherogenesis in this case:
- Exogenous hypercholesterinemia
 - Overeating
 - Hypodynamia
 - Endogenous hypercholesterinemia
 - Stress
52. In the examination, was established the female has insufficient activity of lipoprotein lipase which hydrolyzes the chylomicrons triglycerides on the surface of the endothelium adipose tissue. What biochemical disorders should wait?
- Hyperlipoproteinemia type I
 - Hyperlipoproteinemia II A type
 - Hyperlipoproteinemia of type III
 - Hyperlipoproteinemia of type IV
 - Hyperlipoproteinemia II B type
53. A 58-year-old patient suffers from the cerebral atherosclerosis. Examination revealed hyperlipidemia. What class of lipoproteins will most probably show increase in concentration in this patient's blood serum?
- Low-density lipoproteins
 - High-density lipoproteins
 - Fatty acid complexes with albumins
 - Chylomicrons
 - Cholesterol
54. A patient underwent a course of treatment for atherosclerosis. Laboratory tests revealed an increase in the antiatherogenic lipoprotein fraction in the blood plasma. The treatment efficacy is confirmed by the increase in:
- HDL
 - VLDL
 - IDL
 - LDL
 - Chylomicrons
55. During the examination of the patient, the increase in blood serum in low density lipoproteins was detected. What disease can be foreseen in this patient?
- Atherosclerosis
 - Kidney damage
 - Acute pancreatitis
 - Gastritis
 - Lung inflammation
56. During examination of a teenager with xanthomatosis the family history of hypercholesterolemia is revealed. What transportable lipids are increased in concentration in case of such a disease?
- Low-density lipoproteins
 - Chylomicrons
 - Very low-density lipoproteins
 - High-density lipoproteins
 - Intermediate-density lipoproteins
57. In the blood of patients with diabetes mellitus, increases the content of free fatty acids (HFAs) are observed. The reason for this may be:
- Increasing the activity of adipocyte triglycerid lipase
 - Accumulation in the cytosol of palmitic-CoA
 - Activation of ketone bodies utilization
 - Activation of the synthesis of apolipoproteins A-1, A-2, A-4
 - Reduced plasma phosphatidylcholine-cholesterol acyltransferase activity
58. In the case of diabetes mellitus and starvation in the blood, the amount of acetone bodies used in the quality of energy material increases. Name the substance from which they are synthesized:
- Acetyl-CoA
 - Succinyl-CoA
 - Citrate
 - Malate
 - Ketoglutarate
59. A 67-year-old man consumes eggs, pork fat, butter, milk and meat. Blood test results: cholesterol - 12,3 mmol/l, total lipids - 8,2 g/l, increased low-density lipoprotein fraction (LDL). What type of hyperlipoproteinemia is observed in the patient?
- Hyperlipoproteinemia type IIa
 - Hyperlipoproteinemia type I
 - Hyperlipoproteinemia type IIIb
 - Hyperlipoproteinemia type IV
 - Cholesterol, hyperlipoproteinemia
60. Cholesterol content in blood serum of a 12-year-old boy is 25 mmol/l. Anamnesis states hereditary familial hypercholesterolemia caused by synthesis disruption of receptor-related proteins for:
- Low-density lipoproteins

- B. High-density lipoproteins
- C. Chylomicrons
- D. Very low-density lipoproteins
- E. Middle-density lipoproteins

61. Increased HDL levels decrease the risk of atherosclerosis. What is the mechanism of HDL antiatherogenic action?

- A. They remove cholesterol from tissues

- B. They supply tissues with cholesterol
- C. They are involved in the breakdown of cholesterol
- D. They activate the conversion of cholesterol to bile acids
- E. They promote absorption of cholesterol in the intestine

Amino- acid metabolism and its regulation

1. A 36-year-old female patient who has been limiting the number of foodstuffs in her diet for 3 months presents with a decrease in body weight, deterioration of physical and mental health, face edemata. These changes may be caused by the deficiency of the following nutrients:
 - A. Proteins
 - B. Vitamins
 - C. Fats
 - D. Carbohydrates
 - E. Micronutrients
2. In the daily diet of an adult healthy person should be fats, proteins, carbohydrates, vitamins, mineral salts and water. Specify the amount of protein per day, which provides normal functioning of the body.
 - A. 100-120 g
 - B. 50-60 g
 - C. 10-20 g
 - D. 70-80 g
 - E. 40-50 g
3. A 30 years old patient with acute inflammation of the liver (pancreatitis), violations of cavity digestion of proteins were detected. This may be due to insufficient synthesis and secretion of the gland of such an enzyme:
 - A. Trypsin
 - B. Pepsin
 - C. Lipase
 - D. Dipeptidase
 - E. Amilaza
4. The patient was brought to the hospital with burns of skin. To clean the wounds from dead tissues and mucus, the doctor prescribed an enzyme preparation for local treatment. Name it:
 - A. Tripsin
 - B. Pansinorm
 - C. Asparaginase
 - D. Pepsin
 - E. Streptokinase
5. A patient with gastric juice hypersecretion has been recommended to exclude from the diet broths and vegetable in fused water. A doctor recommended it, because these food products stimulate production of the following hormone:
 - A. Gastrin
 - B. Secretin
 - C. Cholecystokinin
 - D. Somatostatin
 - E. Neurotensin
6. Young man, due to the irritation of the carotic plexus by the inflammatory process (solarium), the functional activity of the glands of the stomach is increased, which is expressed, in particular, in the increase of the product of chloride acid. Which of the following substances causes hypochlorhydria in this case?
 - A. Gastrin
 - B. Gastrointestinal peptide
 - C. Urologist
 - D. Glukagon
 - E. Kalikrein
7. The pyloric part of the stomach has been removed. Reducing the secretion of which hormone should be seen first of all?
 - A. Gastrin
 - B. Histamin
 - C. Secretin
 - D. Cholecystokinin
 - E. Stinging digestive peptide
8. In order to determine the maximum secretion of hydrochloric acid in gastric juice, a solution of histamine was given to 42-year-old patient. This led to increasing of the secretion of the parietal gland of such component of juice as:
 - A. Bicarbonates
 - B. Trypsinogen
 - C. Lipase
 - D. Amilaza
 - E. Slime
9. In the acute experiment, a weak solution of hydrochloric acid was introduced into the cavity of the duodenum of animal. Will it increase the secretion of the gastrointestinal hormone?
 - A. Secretin
 - B. Gastrin
 - C. Motilin
 - D. Neurotensin
 - E. Histamin
10. Transformation of proteins in the stomach is the initial stage of protein digestion in the human digestive tract. What are the enzymes involved in digestive proteins in the stomach:

- A. Pepsin and gastrin
- B. Trypsin and Chymotrypsin
- C. Chymotrypsin and lysozyme
- D. Enteropeptidase and elastase
- E. Carboxypeptidase and aminopeptidase

11. A newborn child suffers from milk curdling in stomach, this means that soluble milk proteins (caseins) transform to insoluble proteins (paracaseins) by means of calcium ions and a certain enzyme. What enzyme takes part in this process?

- A. Renin
- B. Pepsin
- C. Gastrin
- D. Secretin
- E. Lipase

12. A patient has been prescribed pyridoxal phosphate. What processes are corrected with this drug?

- A. Transamination and decarboxylation of amino acids
- B. Oxidative decarboxylation of keto acids
- C. Deamination of amino acids
- D. Synthesis of purine and pyrimidine bases
- E. Protein synthesis

13. To the hospital delivered 7 years-old child with allergic shock, which developed after she was stung by bee. In the blood, the concentration of histamine is increased. The result of which reaction formed this amine?

- A. Decarboxylation
- B. Hydroxylation
- C. Degradation
- D. Deamination
- E. Restoration

14. The allergen was administered to the patient, tested for hypersensitivity, under the skin, and then saw reddening, edema, and even after the action of histamine. As a result of which the amino acid conversion of histidine forms this biogenic amine?

- A. Decarboxylation
- B. Methylation
- C. Phosphorylation
- D. Isolation
- E. Depositing

15. Pharmacological effects of antidepressants are connected with inhibition of an enzyme catalyzing biogenic amines

noradrenaline and serotonin in the mitochondria of cerebral neurons. What enzyme participates in this process?

- A. Monoamine oxidase
- B. Transaminase
- C. Decarboxylase
- D. Peptidase
- E. Lyase

16. It is known that in the metabolism of catecholamine mediators a special role belongs to the enzyme monoamine oxidase (MAO). How does this enzyme inactivate mediators (noradrenaline, adrenaline, dopamine)?

- A. The oxidative deamination
- B. Addition of an amino group
- C. Removal of the metal group
- D. Carboxylation
- E. Hydrolysis

17. During the catabolism of histidine, a biogenic amine is formed, which has a powerful vasodilating effect. Name it.

- A. Histamine.
- B. DOPA.
- C. Dopamine.
- D. Serotonin.
- E. Noradrenalin.

18. When decarboxylating glutamate in the central nervous system, a mediator of inhibition is formed. Name it.

- A. GAMK.
- B. Glutathione.
- C. Histamine.
- D. Serotonin.
- E. Asparagine.

19. Biogenic amines are used in psychiatry for the treatment of a number of diseases of the central nervous system. Specify the drug of this group, which is a mediator of inhibition:

- A. γ -aminobutyric acid.
- B. Dopamine.
- C. Histamine.
- D. Serotonin.
- E. Taurin.

20. A child 9 months old eats artificial sweeties that are not balanced by the vitamin B6. A child has a periorificial dermatitis, convulsions, anemia. The development of a cramp may be related with a violation of forming of:

- A. GAMK

- B. Gistamin
- C. Serotonin
- D. DOPA
- E. Dopamin

21. What neurotransmitter in the brain tissue can be synthesized from the product of reamination of alpha-ketoglutaric acid?

- A. GAMK
- B. Tryptamine
- C. Dopamine
- D. Serotonin
- E. Noradrenalin

22. In a patient with a diagnosis of malignant carcinoma, the severely increased amount of serotonin in the blood. Choose the amino acid from which this compound is formed:

- A. Tryptophan
- B. Allenin
- C. Leicin
- D. Treonin
- E. Methionin

23. Hospitalized patient with diagnosis of intestinal carcinoids. Analizes showed an increasing secretion of serotonin. It is known that this substance is formed from an amino acid tryptophan. What biomechanical mechanism is the basis of this process?

- A. Decarboxylation
- B. Deamination
- C. Microsomal oxidation
- D. Transamination
- E. Formation of paired compounds

24. Methyl groups (-CH₃) are used in the body to synthesize such important compounds as creatine, choline, adrenaline, and others. The source of these groups is one of the essential amino acids, namely:

- A. Methionin
- B. Valin
- C. Leicin
- D. Isoleucine
- E. Tryptophan

25. Cationic glycoproteins are the main components of salivation of parotid glands. What amino acids cause their positive charge?

- A. Lizin, arginine, histystine
- B. Aspartate, glutamate, glycine
- C. Aspartate, arginine, glutamate
- D. Glutamate, valine, leucine

- E. Cysteine, glucine, proline

26. There are several ways to dispose of ammonia in the body, but for specific organs are specific. What is the way to neutralize this toxic substance is typical for brain cells?

- A. Formation of glutamine.
- B. Formation NH₄⁺.
- C. Formation of asparagine.
- D. Formation of Creatine.
- E. Formation of urea.

27. Ammonia is a very poisonous substance, especially for the nervous system. What substance is particularly active in ammonia disinfection in brain tissues?

- A. Glutamic acid.
- B. Lizin.
- C. Proline.
- D. Hystidine.
- E. Alanin.

28. It is known that accumulation of ammonia is the main cause of cerebral coma in hepatic insufficiency. What is a free amino acid plays a primary role in the use of this toxic substance in the brain?

- A. Glutamic acid.
- B. Alanin.
- C. Histidine.
- D. Tryptophan.
- E. Cysteine.

29. After an injury to the brain, the patient has an increased ammonia formation. What amino acid is involved in removing ammonia from this tissue?

- A. Glutaminov.
- B. Valin.
- C. Lizin.
- D. Tyrosin
- E. Tryptophan

30. The patient entered the clinic with a concussion of the brain. On the background of neurological symptoms, the concentration of ammonia in the blood increases. What substance should be used to neutralize this substance in the brain tissue?

- A. Glutamic acid
- B. Gistamin
- C. Ascorbic acid
- D. Serotonin
- E. Nicotinic acid

31. After the operation on the intestines, the patient appeared symptoms of poisoning with ammonia according to the type of stomach coma. What mechanism of action of ammonia on the energy supply of the central nervous system?
- Braking (slowdown) CTK due to the binding of alpha ketoglutarate
 - Braking of glycolysis
 - Braking of beta-oxidation of fatty acids
 - Inactivation of the enzymes of respiratory chain
 - Dissociation of oxidative phosphorylation
32. In a newborn child there is a decrease in intensity of sucking, frequent vomiting, hypotension. In urine and blood, the concentration of citrulline is significantly increased. What metabolic process is affected?
- Ornithine cycle
 - Glycolysis
 - Core's cycle
 - CTK
 - Gluconeogenesis
33. In a 3 year old child, which outlived the severe viral infection, the doctor has indicated re-vomiting, unconsciousness, convulsions. The hyperammonemia was detected during the analysis. What can be connected with changing of the biochemical indicators of blood in this child?
- Violation of ammonia neutralization in the ornithine cycle
 - Activation of the processes of decarboxylation of amino acids
 - Violation of neutralizing of biogenic amines
 - Strengthening of decay of proteins in the intestines
 - Depressing the activity of transamination enzymes
34. The main part of nitrogen is taking out of organism as element of urea. Reducing the activity of what liver enzyme leads to inhibition of the synthesis of urea and increasing the accumulation of ammonia in blood and tissues?
- Carbamoyl phosphate synthase
 - Aspartate aminotransferase
 - Urease
 - Amilaza
 - Pepsin
35. In a 2 year old child, there is a Intellectual disability, intolerance of protein foods, severe hyperammonia as the result of reduced level of urea in the plasma of blood, which is connected with birth deficiency of such mythohondrial enzyme as:
- Carbamoyl phosphate synthase
 - Citrate synthase
 - Succinate dehydrogenase
 - Malatedehydrogenase
 - Monoamine oxidase
36. In the biosynthesis of urea in the liver, the formation of ornithine and urea is stimulated. What amino acid is the intermediate product of this synthesis?
- Arginine
 - Leicinc.
 - Citrate.
 - Valin.
 - Tryptophan.
37. In the urine of the newborn, determined by citrulline and high levels of ammonia. Indicate which substance is most likely to be inflicted on a baby?
- Urea.
 - Bilirubin.
 - Creatine.
 - Creatinine.
 - Uric acid.
38. In a patient with reduced singular function of the kidneys, an unpleasant odor is noted from the mouth. Increased excretion of the salivary glands of what substance is the cause of this?
- Urea
 - α -amylase.
 - Mutsina.
 - Lysozyme.
 - Fosfatasi.
39. A patient in an unconscious state is delivered by an ambulance brigade to the hospital. Objectively: reflexes are absent, seizures occur periodically, breathing is unequal. After a laboratory examination, the liver was diagnosed with a coma. The accumulation of which metabolites in the blood is essential for the appearance of central nervous system disorders?
- Ammonia.
 - Bilirubin.
 - Gistamin.

- D. Glutamin.
- E. Urea.

40. In a boy of 4 years after suffering from severe viral hepatitis, vomiting, episodes of nephropathy, seizures are observed. In the blood there is hyperammonia. Violation of which of the biochemical process in the liver caused such a condition of the patient?

- A. Disposal of ammonia.
- B. Decarboxylation of amino acids.
- C. Disposal of Biogenic Amines.
- D. Synthesis of alphabets.
- E. Gluconeogenesis.

41. Examination of a 2 year-old child with renal insufficiency revealed hyperoxaluria that caused depositing of calcium oxalate stones in the kidneys. The reason for this condition is a disturbance of metabolism of the following aminoacid:

- A. Glycine
- B. Lysine
- C. Methionine
- D. Arginine
- E. Histidine

42. Antioxidant enzymes inhibit lipid peroxidation processes. Decrease of glutathione peroxidase activity is caused by deficiency of the following microelement:

- A. Selenium
- B. Molybdenum
- C. Cobalt
- D. Manganese
- E. Copper

43. Blood vessels endothelium has a significantly high metabolic activity as it synthesizes a variety of vasoactive substances. What powerful vasodilator is synthesized from L-arginine?

- A. Nitric oxide
- B. Histamine
- C. Bradykinin
- D. Acetylcholine
- E. Epinephrine

44. Nitric oxide is a powerful vasodilator and blood pressure regulator. In human organism it is synthesized from:

- A. Arginine
- B. Proline
- C. Lysine

- D. Methionine
- E. Glutamine

45. A 46-year-old patient suffers from progressing Duchenne muscular dystrophy. Changes of the following blood enzyme level may diagnose this condition:

- A. Creatine phosphokinase
- B. Lactate dehydrogenase
- C. Pyruvate dehydrogenase
- D. Glutamate dehydrogenase
- E. Adenylate kinase

46. It was found that the cause of dizziness, memory impairment, and periodic judgment in the patient is a violation of the decarboxylation of glutamic acid. What is the product of this reaction:

- A. GAMK.
- B. PAUL
- C. TDP
- D. ATP.
- E. TGFK.

47. A 24 year-old patient that suffers from epilepsy was administered glutamic acid. What product of its decarboxylation caused the therapeutic effect?

- A. GABA
- B. Histamine monoxygenase
- C. Serotonin
- D. Dopamine
- E. Taurine

48. A baby has epileptical convulsions that are caused by vitamin B6 deficiency. It is due to the decrease of GABA in the neural tissue. What enzyme activity is decreased in this case?

- A. Glutamate decarboxylase
- B. Alanine aminotransferase
- C. Glutamate dehydrogenase
- D. Pyridoxal kinase
- E. Glutamate synthetase

49. In a patient with a sharp increase in serotonin level, the diagnosis of "malignant carcinoid" is observed in the blood. Choose the amino acid from which the given biogenic amine can be formed.

- A. Tryptophan.
- B. Alanine.
- C. Leicin.
- D. Methionine
- E. Threonine.

50. A patient suffering from pellagra was examined. It was found that his diet included almost no meat and consisted mostly of corn. His condition was caused by the deficiency of the following substance in corn: A. Tryptophan
B. Tyrosine
C. Proline
D. Alanine
E. Histidine
51. A patient that is suffering from congenital Hartnup disease has pellagra-like dermatosis and mental retardation due to the deficiency of nicotinic acid. The reason for this condition is the violation of the following process:
A. Tryptophan absorption and reabsorption in the kidneys
B. Phenylalanine transamination
C. Tryptophan decarboxylation
D. Methionine absorption and reabsorption in the kidneys
E. Cysteine absorption and reabsorption
52. A woman was bitten by a wasp. Shortly after the bite a painful and itching blister was formed. After some more time hives and dyspnea developed. What factor was the reason for it?
A. Histamine
B. Hagemann factor
C. Lysosomal enzymes
D. Norepinephrine
E. Epinephrine
53. Shortly after the dental treatment the patient has developed red itching blemishes on the facial skin and oral mucosa. Urticaria was diagnosed. Vasodilatation and itching were caused by the following bioactive substance:
A. Histamine
B. Prostaglandin E2
C. Leucotriene B4
D. Interleukin-1
E. Bradykinin
54. The patient has an allergic reaction, which is accompanied by itching, swelling and reddening of the skin. Concentration of which biogenic amine has increased in tissues?
A. Histamine.
B. Gamma-aminobutyric acid.
C. Dopamine.
D. Serotonin.
E. Triptamin.
55. A patient has the initial stage of gingivitis. Dilatation of the microcirculatory vessels caused gum hyperaemia. What substance produced by mast cells caused the changes mentioned above?
A. Histamine
B. Epinephrine
C. Substance P
D. Endorphins
E. Acetylcholine
56. A cook burned his hand incautiously. What substance has caused the reddening, swelling and pain of the damaged area?
A. Histamine
B. Thiamine
C. Glutamine
D. Lysine
E. Galactosamine
57. L-DOPA is the precursor chemical of dopamine. It is prescribed for Parkinson's disease treatment. What aminoacid is used for its biosynthesis?
A. Tyrosine
B. Alanine
C. Cysteine
D. Histidine
E. Tryptophan
58. A patient suffering from Parkinson's disease has tremor of both hands. This symptom is caused by the deficiency of the following neurotransmitter in the striatopallidal structures:
A. Dopamine
B. GABA
C. Substance P
D. Epinephrine
E. Serotonin
59. An 84 year-old patient suffers from the Parkinson's disease. One of its pathogenetic causes is the deficiency of a neurotransmitter in certain neural structures. What neurotransmitter is it?
A. Dopamine
B. Epinephrine
C. Norepinephrine
D. Histamine
E. Acetylcholine
60. At the examination in the clinic, the man was diagnosed with acute radiation sickness. Laboratory has established a sharp decrease in

serotonin in platelets. The metabolism of a substance is a possible cause of this condition?

- A. 5-oxytryptophane.
- B. Tyrosine.
- C. Histidine.
- D. Phenylalanine.
- E. Serine.

61. A 20-year-old woman came to the doctor with complaints of general weight loss, loss of appetite, weakness, skin discoloration resembling bronze tan. In addition to hyperpigmentation, examination in the hospital revealed bilateral adrenal tuberculosis. What substance leads to skin hyperpigmentation, when accumulated excessively?

- A. Melanin
- B. Bilirubin
- C. Hemozoin
- D. Lipofuscin
- E. Adrenochrome

62. A person consumed methionine-poor products for a long period of time. As a result neural and endocrine disorders have developed. They may be caused by the disturbance of the following substance synthesis:

- A. Adrenaline
- B. Pyruvate
- C. Thyronine
- D. Fatty acids
- E. Glucagon

63. A 12-year-old boy in the urine revealed high levels of all amino acids in the aliphatic row. In this case, the highest excretion of cysteine and cysteine was noted. In addition, ultrasound of the kidneys showed the presence of stones in them. Choose a possible pathology.

- A. Cystinuria.
- B. Alpathururia.
- C. Cystitis
- D. Phenylketonuria.
- E. Hartnup's disease.

64. Parents of the 3-year-old child drew attention to the fact that the child's urine becomes dark when restrained. Objectively: the body temperature is normal, the skin is pink, clean, the stove is not elevated. What disease is accompanied by such manifestations.

- A. Alkaptonuria.
- B. Hemolytic anemia.
- C. Itsenko-Cushing syndrome.

- D. Gout.
- E. Fenilketonuria.

65. What is the most probable diagnosis in a child of infancy, in which there is darkening of sclera, mucous membranes, auricles, separated urine darkens in the air, in the blood and urine found homogentisic acid?

- A. Alkaptonuria.
- B. Albinism.
- C. Hemolytic anemia.
- D. Porphyrria.
- E. Cystinuria.

66. A baby has coloured sclera and mucous and her urine is darkening when exposed to air. Homogentisic acid was found in urine and blood samples. What is the reason for this condition?

- A. Alcaptonuria
- B. Albinism
- C. Galactosemia
- D. Cystinuria
- E. Histidinemia

67. Dark stains on baby's diapers indicate homogentisic acid synthesis. What substance's metabolism is disturbed?

- A. Tyrosine
- B. Galactose
- C. Methionine
- D. Cholesterol
- E. Tryptophan

68. Excretion of homogentisic acid with the urine is the reason for the condition called alcaptonuria. Disturbance of which amino acid metabolism causes this condition?

- A. Tyrosine
- B. Phenylalanine
- C. Alanine
- D. Methionine
- E. Asparagine

69. A 5-year old child has darkened urine but no bile enzymes were found in it. The child is diagnosed with alcaptonuria. Which enzyme deficiency is the reason for it?

- A. Homogentisic acid oxydase
- B. Phenylalanine hydroxylase
- C. Tyrosinase
- D. Oxyphenylpyruvate oxydase
- E. Phenylpyruvate decarboxylase

70. What kind of treatment is needed in a child with phenylketonuria, in whose blood there is an increased amount of phenylpyruvic acid?
- Diet therapy.
 - Antibacterial therapy.
 - Vitamin therapy.
 - Hormonotherapy.
 - Fermentotherapy.
71. A 9-year-old child has a mental and physical lag. In the biochemical analysis of blood, an increased amount of phenylalanine has been detected. Blocking of an enzyme can lead to this condition?
- Phenylalanine-4-monooxygenase.
 - Aspartate aminotransferases.
 - Glutamintransaminase.
 - Glutamate-carboxylase.
 - Oxidases of homogenetic acetic acid.
72. In a sick child, a raised level of phenylpyruvate was detected in the urine (in the norm practically absent). The amount of phenylalanine in the blood is 350 mg/l (about 15 mg/l). Which disease is characterized by the above symptoms?
- Fenilketonuria.
 - Albin.
 - Alpathonuria.
 - Gout
 - Tyrosinosis.
73. A certain type of congenital pathology is accompanied with the inhibition of tyrosine formation from phenylalanine. Biochemical indicator of this condition is depositing of the following acid in the organism:
- Phenylpyruvate
 - Citric acid
 - Pyruvate
 - Lactic acid
 - Glutamine
74. A 6 month-old baby has mental and physical development retardation, seizures, pale eczematous skin, light hair, blue eyes. What substance presence in blood and urine can help to make a diagnosis in this case?
- Phenylpyruvate
 - Tryptophan
 - Histidine
 - Leucine
 - Valine
75. Excess of phenylpyruvate and phenylacetate was detected in the urine sample of a 6 day-old baby. Which amino acid metabolism is disturbed?
- Phenylalanine
 - Tryptophan
 - Methionine
 - Histidine
 - Arginine
76. A 1.5 year-old child is mentally and physically retarded, hair and skin are whitened, the level of catecholamines in the blood is decreased. After adding few drops of 5% solution of ferrum trichloracetate to the urine it changes its colour to olive green. This symptoms are typical for the following condition:
- Phenylketonuria
 - Alcaptonuria
 - Tyrosinosis
 - Albinism
 - Xanthinuria
77. A child with mental and physical development retardation was delivered to the hospital. Phenylpyruvate was found in the urine. Disturbance of which process is the reason for this pathology?
- Amino acid metabolism
 - Lipid metabolism
 - Carbohydrate metabolism
 - Water-salt balance regulation
 - Calcium and phosphate homeostasis
78. A patient with complaints about intolerance to solar radiation was contacted by a doctor. There is burn skin and visual impairment. Preliminary diagnosis of albinism. Disturbance of the exchange of amino acids observed in this patient?
- Tyrosine.
 - Proline
 - Lizin.
 - Alanin.
 - Tryptophan
79. Albinoses has increased sensitivity to sunlight therefore they get burns instead of tan. Which amino acid metabolism disturbance is the reason for the condition?
- Phenylalanine
 - Methionine
 - Tryptophan

- D. Glutamine
- E. Histidine

80. The patient is 12 years old, he has a general weakness, dizziness, fatigability, lag in mental development. In the laboratory examination, high concentrations of valine, isoleucine, leucine in blood and urine were detected. Urine specific odor. What disease does this happen?

- A. Disease of maple syrup.
- B. Basetic disease.
- C. Hystidominemia.
- D. Tyrosinosis.
- E. Addison's Illness.

81. A 13 year-old boy is complaining about general weakness, dizziness, fatigue. Mental retardation is detected. The examination revealed high concentrations of valine, isoleucine, and leucine in blood and urine. The urine has a specific smell. What is the most possible diagnosis?

- A. Maple syrup urine disease
- B. Addison's disease
- C. Tyrosinosis
- D. Histidinemia
- E. Grave's disease

82. The child's urine had a characteristic smell of maple syrup. In the laboratory study, high levels of leucine, valine, isoleucine and their keto-derivatives were found in blood and urine. What kind of enzyme is inadequate for this disease?

- A. Dehydrogenases of branched-chain amino acids.
- B. Aminotransferases.
- C. Glucose-6-phosphatase.
- D. Phosphorutokinase.
- E. Phosphofructomatase.

83. A baby refuses breastfeeding, it is nervous, its respiration is arrhythmic and urine has a specific smell of maple syrup. What congenital enzymopathy is the reason for this condition?

- A. Keto acid dehydrogenase
- B. Glucose-6-phospate dehydrogenase
- C. Glycerol kinase
- D. Aspartate aminotranspherase
- E. UDP-glucoronosyltranspherase

84. A lab test revealed increased concentration of leucine, valine, isoleucine and ketone derivatives in the blood and urine. The urine has

a specific smell of maple syrup. Which enzyme deficiency is typical for this condition?

- A. Amino acid dehydrogenase
- B. Aminotranspherase
- C. Glucose-6-phosphatase
- D. Phosphofructokinase
- E. Phosphofructomutase

85. A hospital admitted a patient with complaints about abdominal swelling, diarrhea, meteorism after consumption of food rich in proteins. It is indicative of disturbed protein digestion and their intensified decaying. What substance is the product of this process in the bowels?

- A. Bilirubin
- B. Indole
- C. Cadaverine
- D. Agmatine
- E. Putrescine

86. A 60 year-old man suffers from chronic intestinal obstruction. The processes of protein decomposition in the large intestine are intensified. What is the evidence of these processes?

- A. Indicanuria
- B. Bilirubinuria
- C. Hyperuricosuria
- D. Creatinuria
- E. Glucosuria

87. A patient has been operated due to acute abdomen. His urine is brown, concentration of indican is higher than 93 mmol/day. What does it indicate?

- A. High intensity of protein decomposition processes in the intestine
- B. Decreased activity of the urea cycle enzymes
- C. Acceleration of aromatic amino acids desamination
- D. Disturbance of the kidney absorption
- E. Decrease of ammonia detoxification

88. A 43 year-old woman has been operated due to acute abdomen. Her urine is brown and the concentration of indican in the blood has increased rapidly. What does it indicate?

- A. High intensity of protein decomposition
- B. Acceleration of amino acids desamination
- C. Supression of glomerular filtration
- D. Decreased intensity of the urea cycle
- E. Inhibition of gluconeogenesis

89. Indican is a byproduct of certain amino acid decomposition in the large intestine. Its excretion with the urine is used to indicate the functional condition of the liver. What is this amino acid?

- A. Tryptophan
- B. Valine
- C. Glycine
- D. Serine
- E. Cysteine