

1. A 15-year-old girl complains of general weakness, dizziness, and frequent fainting spells. She does not eat enough. Recently, she has been noticing a distortion of taste, a desire to eat chalk and raw minced meat. Her menstruations have been occurring since the age of 13 and are profuse and irregular. What substance causes sideropenic syndrome if its levels in the human body are low?

a. Iron

b. Hemosiderin

c. Folic acid

d. Vitamin B<sub>12</sub>

e. Copper

2. A woman with candidiasis was prescribed an antifungal drug that disrupts the synthesis of ergosterol, but can cause dyspeptic disorders (diarrhea, nausea), hepatotoxicity, and headache as its side effects. What drug is it?

a. Fluconazole

b. Metronidazole

c. Albendazole

d. Acyclovir

e. Clarithromycin

3. A 45-year-old woman developed an acute inflammatory disease of the upper respiratory tract and eyes during the season of flowering. She presents with hyperemia, edema, and mucous discharge. What type of leukocytosis would be most characteristic in this case?

a. Eosinophilia

b. Monocytosis

c. Neutrophilia

d. Basophilia

e. Lymphocytosis

4. D-galactose reacts with an ammonia solution of silver oxide. What functional group makes this reaction possible?

a. Aldehyde group

b. Carboxyl group

c. Ether group

d. Hydroxyl group

e. Ester group

5. Which one of the listed heterocyclic compounds exhibits the strongest basic properties?

a. Pyrrolidine

b. Thiophene

c. Furan

d. Pyridine

e. Pyrrole

6. What is the name of the five-membered heterocycle that contains nitrogen heteroatoms of the pyrrole and pyridine type?

a. Pyrazole

b. Piperidine

c. Pyrazolidine

d. Thiazole

e. Triazole

7. What is the name of the lower expanded hollow part of the pistil that contains ovules in a flower?

a. Ovary

b. Stigma

c. Style

d. Receptacle

e. Gynoecium

8. A patient presents with intestinal obstruction and a decrease in the bactericidal effect of gastric

juice, which contributes to the growth of putrefactive microflora. In this case, increased excretion of a certain substance can be observed in urine. Name this substance.

- a. Creatine
- b. Protein
- c. Glucose
- d. Indican**
- e. Lactic acid

9. What medium is used in quantification of halide ions by means of Volhard method (thiocyanometry)?

- a. Nitric acid**
- b. Neutral
- c. Strongly alkaline
- d. Phosphate acid
- e. Weakly alkaline

10. A patient was prescribed losartan potassium for treatment of arterial hypertension. What is the mechanism of action of this drug?

- a. Inhibition of angiotensin-converting enzyme
- b. Activation of central alpha-adrenergic receptors
- c. Calcium channel block
- d. Blockade of angiotensin receptors**
- e. Inhibition of phosphodiesterase

11. When harvesting inflorescences, it was determined that their main axis was well developed and the flowers were almost at the same level, despite being attached to peduncles of varying length. What type of inflorescence is it?

- a. Flat capitulum
- b. Botryoid
- c. Umbel
- d. Corymb**
- e. Spike

12. In cases of methanol poisoning, one of the treatment methods requires administering ethanol (orally or intravenously) in doses large enough to cause intoxication in a healthy person. Why is this treatment method effective?

- a. Ethanol inhibits methanol diffusion
- b. Ethanol breaks down faster than methanol
- c. Ethanol blocks alcohol dehydrogenase coenzyme
- d. Ethanol competes with methanol for the active site of alcohol dehydrogenase**
- e. Ethanol inactivates alcohol dehydrogenase

13. A newborn has been diagnosed with Down syndrome, accompanied by mental retardation, short stature, short fingers and toes, and Mongoloid slant of the eyes. Karyotyping detects trisomy 21. What type of hereditary pathology is Down syndrome?

- a. Fetopathy
- b. Blastopathy
- c. Gametopathy
- d. Molecular genetics disease
- e. Chromosome abnormality**

14. Microscopy of the leaf epidermis reveals stinging hairs with a tall multicellular base, into which the base of an ampoule-shaped living cell with a small head filled with formic acid is immersed. What plant can be characterized by such emergences?

- a. Urtica dioica**
- b. Artemisia absinthium
- c. Achillea millefolium
- d. Bidens tripartita

e. Chelidonium majus

15. A patient was prescribed an antiplatelet agent that has an effect on thromboxane A<sub>2</sub> formation in platelets. What drug is it?

- a. Prednisolone
- b. Menadione
- c. -
- d. Adrenaline tartrate
- e. Acetylsalicylic acid

16. The manufacturer has stated that the half-life of ibuprofen is 2 hours. A patient has been prescribed 400 mg of the drug. How much ibuprofen (mg) will remain in the patient's body 6 hours after taking this dose of the drug?

- a. 150
- b. 100
- c. 0
- d. 50
- e. 25

17. A patient diagnosed with arterial hypertension was prescribed lisinopril. What is the mechanism of action of this drug?

- a. Inhibition of angiotensin-converting enzyme
- b. Stimulation of beta-adrenergic receptors
- c. Blockade of beta-adrenergic receptors
- d. Stimulation of alpha<sub>2</sub>-adrenergic receptors
- e. Blockade of calcium channels in vascular smooth muscle

18. In the process of studying a new lipophilic compound, it was established that after glucuronidation it rapidly excretes with urine. What is the significance of glucuronidation in drug metabolism?

- a. Preventing binding to the target receptor
- b. Increasing water solubility for renal excretion
- c. Strengthening plasma protein binding
- d. Intensifying breakdown and absorption in the stomach
- e. Increasing lipophilicity to improve absorption

19. Which one of the listed solutions will have the highest Van't Hoff isotonic coefficient, if their molar concentration and temperature are the same?

- a. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>
- b. CaCO<sub>3</sub>
- c. MgCl<sub>2</sub>
- d. LiCl
- e. AlBr<sub>3</sub>

20. What structures enable the release of weak solutions of mineral (or, less often, organic) substances in the form of droplets and are arranged in groups on the serrations of the leaf margin?

- a. Hydathodes
- b. Emergences
- c. Laticifers
- d. Idioblasts
- e. Osmophores

21. What end product forms as a result of beta-oxidation of fatty acids with an odd number of carbon atoms?

- a. Acetoacetyl-CoA
- b. Stearoyl-CoA
- c. Palmitoyl-CoA
- d. Acetyl-CoA
- e. Propionyl-CoA

22. Protein-containing liquids, where proteins must remain undenatured, undergo sterilization at the temperature of 56-58°C in several 60-minute-long sessions over the course of 5 days. What method of sterilization is it?

- a. Flame sterilization
- b. Moist heat sterilization
- c. Pasteurization
- d. Autoclaving
- e. Tyndallization**

23. A plant is completely submerged in water. What ecological group does this plant belong to?

- a. Xerophytes
- b. Hydrophytes**
- c. Hygrophytes
- d. Succulents
- e. Mesophytes

24. Microscopy of a rhizome detects periphloematic vascular bundles. What plant does this rhizome belong to?

- a. *Convallaria majalis*
- b. *Dryopteris filix-mas***
- c. *Elymus repens*
- d. *Acorus calamus*
- e. *Potentilla erecta*

25. A 54-year-old man with 4-year-long history of chronic glomerulonephritis and 2-year-long history of persistent arterial hypertension made an appointment with a doctor. What substance synthesized in the kidneys plays an important role in the development of arterial hypertension in this patient?

- a. Erythropoietin
- b. Renin**
- c. Nitric oxide
- d. Vitamin D
- e. Aldosterone

26. People, who were in the building during a fire, suffer from carbon monoxide poisoning. What type of hypoxia can be observed in this case?

- a. Hypoxic hypoxia
- b. Circulatory hypoxia
- c. Hemic hypoxia**
- d. Respiratory hypoxia
- e. Tissue hypoxia

27. A 55-year-old patient was prescribed an organic nitrate drug for rapid relief of angina pectoris attacks. Select this drug from the list.

- a. Digoxin
- b. -
- c. Propranolol hydrochloride
- d. Glycerol trinitrate**
- e. Verapamil hydrochloride

28. Disperse systems can be divided into lyophilic and lyophobic ones, based on the intensity of interaction between the particles of the dispersed phase and the dispersion medium. What disperse system is lyophobic?

- a. Tannin solutions
- b. Clay dispersions
- c. Foams**
- d. Solutions of high-molecular compounds
- e. Surfactant solutions

29. A patient complains of headache episodes with nausea and vomiting. During examination,

patient's blood pressure - 180/100 mm Hg, blood glucose levels - 14.8 mmol/L. Magnetic resonance tomography detects pituitary adenoma. What pathology has caused the development of hyperglycemia in this patient?

- a. Hypothyroidism
- b. Addison disease
- c. Cushing disease**
- d. Diabetes insipidus
- e. Pituitary dwarfism

30. A 65-year-old man developed third-degree atrioventricular block. What medicine should be prescribed for this patient?

- a. Verapamil hydrochloride
- b. Atropine sulfate**
- c. Digoxin
- d. Amiodarone hydrochloride
- e. Metoprolol

31. What specific reagent is used for identification of  $\text{Fe}^{2+}$  cations?

- a.  $\text{K}_2\text{Na}[\text{Co}(\text{NO}_2)_6]$
- b.  $\text{K}_3[\text{Fe}(\text{CN})_6]$**
- c.  $\text{H}_2\text{SO}_4$
- d. NaOH
- e.  $\text{NH}_4\text{OH}$

32. What anticholinesterase agent can be used to stimulate intestinal peristalsis in the patients during the postoperative period?

- a. Suxamethonium chloride
- b. Adrenaline tartrate
- c. Metoprolol
- d. Neostigmine methylsulfate**
- e. Salbutamol

33. What feature of a leaf is characteristic of Poaceae?

- a. Stipules
- b. Leaf blade
- c. Leaf sheath**
- d. Ochrea
- e. Petiole

34. What indicator is used in titrimetric determination of substances by means of mercurimetry (complexometry)?

- a. Phenolphthalein
- b. Methyl orange
- c. Diphenylcarbazide**
- d. Starch
- e. Potassium chromate

35. What group reagent can be used to separate group III cations (acid-base classification), when conducting systematic analysis of a mixture?

- a. Sulfuric acid**
- b. Ammonia
- c. Barium chloride
- d. Hydrochloric acid
- e. Alkali and hydrogen peroxide

36. A 48-year-old patient complains of thirst, frequent urination, dryness of skin and mucosa, and trophic ulcers that appeared on his legs. Examination detects blood glucose levels of 16 mmol/L and glucose in urine. What disease has occurred in the patient?

- a. Diabetes mellitus**

- b. Kidney failure
- c. Diabetes insipidus
- d. Nephrogenic diabetes insipidus
- e. Insulinoma

37. How does the value of the critical micelle concentration in homologous series change when the molecular mass of the surfactant increases?

- a. Remains unchanged
- b. Sharply increases
- c. Decreases**
- d. Increases
- e. Reaches its maximum and then decreases

38. What amine causes a positive isonitrile reaction?

- a. N,N-Dimethylamine
- b. Benzylamine**
- c. Diphenylamine
- d. Diethylamine
- e. Tetramethylammonium chloride

39. What inflorescences are most typical of the Brassicaceae family?

- a. Corymb, umbel
- b. Round or flat capitulum
- c. Raceme, panicle**
- d. Spadix, spike
- e. Compound corymb, compound umbel

40. What reaction can be used to identify multiple bonds in organic compounds?

- a. Hofmann rearrangement
- b. Wagner reaction**
- c. Kucherov reaction
- d. Claisen condensation
- e. Friedel-Crafts alkylation

41. Amylolytic enzymes catalyze hydrolysis of polysaccharides and oligosaccharides. They have an effect on the following chemical bond:

- a. Phosphodiester bond
- b. Glycosidic bond**
- c. Amide bond
- d. Hydrogen bond
- e. Peptide bond

42. What group of broncholytics is used for treatment of patients with bronchial asthma?

- a. Nicotinic agonists
- b. Muscarinic agonists
- c. beta-adrenergic blockers
- d. beta\_2-adrenergic agonists**
- e. Anticholinesterase drugs

43. What laboratory glassware is used for dissolving an exactly measured out sample when preparing a primary standard solution?

- a. Measuring flask**
- b. Cylinder
- c. Test tube
- d. Measuring glass
- e. Beaker

44. What adsorption indicator is used in quantification of iodides by means of the Fajans method?

- a. Methyl orange

- b. Phenolphthalein
- c. Diphenylamine
- d. Eosin
- e. Murexide

45. A 34-year-old woman with bronchitis has persistent, dry, non-productive cough. Her physician prescribed her a centrally acting antitussive drug. Select this drug from the list.

- a. Mucaltin
- b. Bromhexine hydrochloride
- c. Acetylcysteine
- d. Ambroxol hydrochloride
- e. Glaucine hydrochloride

46. In the patient's blood, increased activity of AST, LDH1, LDH2, and CPK was detected. What organ is the most likely site of a pathological process in this case?

- a. Skeletal muscles
- b. Adrenal glands
- c. Heart muscle
- d. Liver
- e. Kidneys

47. A flower has many stamens, fused together by filaments into several bundles. What type of androecium is it?

- a. Polyadelphous
- b. Monadelphous
- c. Diadelphous
- d. Didynamous
- e. Tetradynamous

48. Pathogenic microorganisms can be characterized by the presence of enzymes of aggression that determine their virulence. Select an enzyme of aggression from the list below.

- a. Oxidase
- b. Transferase
- c. Lyase
- d. Hyaluronidase
- e. Carbohydase

49. What compound contains a primary aromatic amino group?

- a. (CH<sub>3</sub>)<sub>3</sub>N (trimethylamine)
- b. (CH<sub>3</sub>)<sub>2</sub>NH (dimethylamine)
- c. (CH<sub>3</sub>)<sub>3</sub>C-NH<sub>2</sub> (tert-butylamine)
- d. (C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>N (triphenylamine)
- e. C<sub>6</sub>H<sub>5</sub>-NH<sub>2</sub> (aniline)

50. What is characteristic of benign tumors?

- a. Infiltrating growth
- b. Cancer cachexia
- c. Expansive growth
- d. Invasion into the surrounding tissues
- e. Metastasis

51. A pharmacy has decided to use the biological method to test the quality of instrument sterilization in an autoclave. What microorganisms should be used for this purpose?

- a. *Borrelia recurrentis*
- b. *Streptococcus pyogenes*
- c. *Salmonella typhi*
- d. *Yersinia pestis*
- e. *Bacillus subtilis*

52. What functional groups are present in the cyclic forms of ribose and deoxyribose?

- a. Only carboxylic
- b. Only aldehyde
- c. Hydroxylic and carboxylic
- d. Only hydroxylic**
- e. Hydroxylic and aldehyde

53. What method of instrumental analysis can be used for quantification of hydrochloric and boric acids in a mixture?

- a. Infrared spectroscopy
- b. Potentiometry**
- c. Chromatography
- d. Polarimetry
- e. Spectrophotometry

54. Analysis of a medicinal plant shows that its leaves are collected into a basal rosette, the leaves themselves are broadly ovate or elliptic with arcuate venation, while the flowers are small, unremarkable, and assembled into an inflorescence - a dense spike. What plant can be characterized by such features?

- a. *Althaea officinalis*
- b. *Plantago major***
- c. *Chelidonium majus*
- d. *Taraxacum officinale*
- e. *Vinca minor*

55. Disperse systems can be distinguished from true solutions by the bluish glow of colloidal solutions against a dark background when illuminated from the side. Name this phenomenon.

- a. Fluorescence
- b. Chemiluminescence
- c. Emission
- d. Scattering
- e. Opalescence**

56. A patient has pulmonary edema. What drug must be prescribed in this case to reduce the volume of circulating blood?

- a. Amiodarone hydrochloride
- b. Magnesium sulfate
- c. Metoprolol
- d. Furosemide**
- e. Verapamil hydrochloride

57. A plant has essential oil glands, its fruit is an achene, its inflorescence is a flat capitulum. What plant family can be characterized by such features?

- a. Solanaceae
- b. Asteraceae**
- c. Lamiaceae
- d. Rosaceae
- e. Scrophylariaceae

58. After being stung by bees, the patient developed Quincke's edema. What drug should the patient be urgently administered for the treatment of this condition?

- a. Furosemide
- b. Propranolol hydrochloride
- c. Diphenhydramine hydrochloride
- d. Atropine sulfate
- e. Adrenaline tartrate**

59. A doctor has prescribed benzylpenicillin for the treatment of a surgical patient with numerous abscesses of staphylococcal etiology. What is the mechanism of action of this antibiotic?



- a. Disruption of nucleic acid synthesis
- b. Inhibition of DNA topoisomerases
- c. Inhibition of cytoplasmic membrane functions
- d. Disruption of ribosomal protein synthesis
- e. Disruption of cell wall synthesis**

60. What side effect is characteristic of lisinopril?

- a. Orthostatic hypertension
- b. Bronchospasm
- c. Red urine
- d. Dry cough**
- e. Hyperglycemia

61. What is the structural formula for 3-chloropropene?

- a.  $\text{CH}_2=\text{CH}-\text{CH}=\text{CHCl}$
- b.  $\text{ClCH}_2-\text{CH}=\text{CH}_2$**
- c.  $\text{ClCH}_2-\text{CH}=\text{CH}-\text{CH}_3$
- d.  $\text{CH}_2=\text{CCl}-\text{CH}_3$
- e.  $\text{ClCH}=\text{CH}-\text{CH}_3$

62. A 14-year-old boy, who has been suffering from bronchial asthma since childhood, after significant physical exertion developed shortness of breath and impaired respiratory rate and depth, characterized by difficult and prolonged exhalation. What pathological type of breathing has developed in this case?

- a. Gasping
- b. Expiratory dyspnea**
- c. Biot's breathing
- d. Kussmaul breathing
- e. Inspiratory dyspnea

63. Monosaccharides can be easily oxidized, but depending on the nature of the oxidant and the conditions under which oxidation occurs, different products will form. What compound forms when D-glucose is oxidized using bromine water?

- a. D-Gluconic acid**
- b. D-Glucuronic acid
- c. Bromoderivative of D-glucose
- d. D-Glucaric acid
- e. D-glucose osazone

64. When a pharmaceutical company was manufacturing an enzyme drug, a violation of the technological process occurred: the drug was heated to  $85^\circ\text{C}$ . What changes will be observed in its enzyme activity?

- a. Increased enzyme activity due to increased molecular motion
- b. Temporary decrease in enzyme activity that later resumes after cooling
- c. Minor changes in enzyme activity due to enzyme thermostability
- d. Protein denaturation and complete loss of enzyme activity**
- e. Impaired structure of metal ions in the active site

65. What cations are present in a solution if, after adding dimethylglyoxime (Chugaev reagent) and ammonia buffer solution to it, a bright crimson intracomplex compound forms as a result?

- a. Nickel cations**
- b. Calcium cations
- c. Aluminum cations
- d. Copper cations
- e. Cobalt cations

66. A patient has been hospitalized with the diagnosis of diabetic hyperglycemic coma. The patient's breathing is slow, deep, and noisy. The inhalation phase is longer than the exhalation phase. What type of breathing has developed in the patient?

- a. Apneic breathing
- b. Biot breathing
- c. Gasping
- d. Cheyne-Stokes breathing
- e. Kussmaul breathing**

67. What method of chromatographic analysis can be used for separation, identification, and quantification of methanol and ethanol in a mixture?

- a. Precipitation chromatography
- b. Paper chromatography
- c. Ion exchange chromatography
- d. Gas-liquid chromatography**
- e. Planar chromatography

68. Primary and secondary nitroalkanes are tautomeric compounds. What tautomerism is characteristic of these compounds?

- a. Lactam-lactim tautomerism
- b. Keto-enol tautomerism
- c. Aci-nitro tautomerism**
- d. Tautomerism of azoles
- e. Amino-imino tautomerism

69. A patient diagnosed with arterial hypertension has been prescribed a drug with an antihypertensive, antianginal, and antiarrhythmic effect. Name this drug.

- a. Metoprolol**
- b. Dopamine hydrochloride
- c. Fenoterol
- d. Clonidine
- e. Adrenaline tartrate

70. Urinalysis of a patient with diabetes mellitus detects glucosuria. What is the renal threshold for glucose reabsorption?

- a. 15 mmol/L
- b. 10 mmol/L**
- c. 5 mmol/L
- d. 20 mmol/L
- e. 1 mmol/L

71. A solution contains aluminum, potassium, and sodium cations. Into this solution a small amount of ammonium hydroxide and alizarin solution was added, resulting in production of a bright red precipitate (varnish). What ion has been detected as the result of this reaction?

- a. Potassium
- b. Sodium
- c. Barium
- d. Calcium
- e. Aluminum**

72. In systematic analysis of group IV cations, hydrogen peroxide must be added along with the group reagent. Why must this substance be added?

- a. For formation of hydroxo- and oxoanions of these elements at the lowest oxidation degrees
- b. For more complete precipitation of these cations
- c. For formation of hydroxo- and oxoanions of these elements at the highest oxidation degrees**
- d. For formation of peroxide compounds of these cations
- e. For destruction of hydrate complexes

73. When studying the chemical properties of an organic compound, it was established that it exhibits basic properties and easily undergoes halogenation and diazotization reactions. What compound meets these criteria?

- a. Benzene**

b. Toluene

c. Aniline

d. Naphthalene

e. Phenol

74. In the cells of eukaryotic organisms, the DNA is bound to proteins. What proteins are bound to the DNA molecule and stabilize it?

a. Histones

b. Glutelins

c. Albumins

d. Globulins

e. Interferons

75. A bodybuilder athlete came to a pharmacy complaining of hyperthermia. To improve his athletic performance, he used the banned doping compound 2,4-dinitrophenol that uncouples oxidative phosphorylation. What effect of this compound on mitochondria can explain these symptoms?

a. Decreased oxygen consumption and inhibition of ATP synthesis

b. Increased oxygen consumption and activation of ATP synthesis

c. Decreased ATP synthesis and energy release in the form of heat

d. Increased acetyl-CoA levels and stimulation of tricarboxylic acid cycle

e. Increased use of ATP for cAMP synthesis

76. Phosphorylation reactions in the cell are catalyzed by enzymes that have the trivial name of "kinases". What class of enzymes do they belong to?

a. Isomerases

b. Oxidoreductases

c. Lyases

d. Transferases

e. Ligases

77. What titrants are used in quantification of iodides by means of back titration, using the Volhard method?

a. Mercury(II) nitrate, ammonium thiocyanate

b. Silver nitrate, sodium chloride

c. Mercury(I) nitrate, potassium thiocyanate

d. Silver nitrate, ammonium thiocyanate

e. Mercury(I) nitrate, ammonium thiocyanate

78. What indicator is used in argentometric determination of chloride ions in Mohr's method?

a. Methyl red

b. Fluorescein

c. Potassium chromate

d. Eosin

e. Diphenylcarbazone

79. The fructose molecule belongs to ketoses. What phenomenon causes fructose to take part in the "silver mirror" reaction?

a. Mutarotation

b. Condensation

c. Dehydration

d. Conformation

e. Epimerization

80. At a pharmaceutical factory, an alkaloid must be extracted from a herbal raw material. What would ensure effective extraction of this substance?

a. The substance must have different solubility in two different solvents

b. The substance must enter into a chemical reaction with the solvent

c. Solvents must have similar polarity values

d. The extraction process must be carried out at a high temperature

e. Solvents must be miscible with each other

81. A doctor prescribed zopiclone to a patient complaining of insomnia. This drug has a hypnotic effect, because it interacts with certain receptors. Name these receptors.

a. H<sub>1</sub>- and H<sub>2</sub>-histamine receptors

**b. Benzodiazepine and GABA receptors**

c. alpha- and beta-adrenergic receptors

d. Serotonin and opioid receptors

e. Muscarinic and nicotinic acetylcholine receptors

82. What product forms as a result of aldehydes and ketones reacting with primary amines?

**a. Azomethine**

b. Thiol

c. Diazine

d. Alcohol

e. Nitrile

83. What drug inhibits hydroxymethylglutaryl-CoA reductase enzyme and reduces cholesterol synthesis?

**a. Atorvastatin**

b. Hydrochlorothiazide

c. Furosemide

d. Amlodipine besylate

e. Lisinopril

84. What principle is used when calculating the phase transition temperature at different pressure?

**a. Clausius-Clapeyron equation**

b. Gibbs phase rule

c. Trouton rule

d. Konovalov rules

e. Mendeleev-Clapeyron equation

85. What is the name of the single elongated crystals with pointed ends that can be detected during the microscopy of the herbal raw material harvested from a monocotyledonous plant?

a. Cystoliths

b. Crystalline sand

**c. Styloids**

d. Druses

e. Globoids

86. Berberis vulgaris has spines that are modifications of:

a. Petioles

b. Stems

**c. Leaves**

d. Rachises

e. Stipules

87. What type of chromatography includes the gas-liquid chromatography?

a. Affinity chromatography

b. Adsorption chromatography

**c. Distribution chromatography**

d. Gel chromatography

e. Ion exchange chromatography

88. What pair of compounds can be distinguished from each other using the silver mirror reaction?

**a. Propanal and propanone**

b. 1,3-Butadiene and 1,2-butadiene

c. Ethanol and ethylene glycol

d. Propane and propene

e. n-Butane and isobutane

89. A man diagnosed with epilepsy has been taking phenobarbital for a long time. Over time, he has noticed a decrease in the therapeutic effect of the drug - he has developed tolerance to this drug. What is the mechanism of developing tolerance to phenobarbital?

a. Acceleration of biotransformation

b. Inhibition of biotransformation

c. Weakening of the absorption process

d. Accumulation of the substance in the body

e. Increased sensitivity of receptors

90. A patient diagnosed with stomatitis was prescribed a fat-soluble vitamin preparation that takes part in redox processes and accelerates mucosal epithelization. What drug is it?

a. Folic acid

b. Ergocalciferol

c. Ascorbic acid

d. Retinol acetate

e. -

91. What enzyme is used to synthesize genes from matrix RNA on DNA in RNA-containing viruses?

a. DNA ligase

b. Exonuclease

c. Endonuclease

d. Helicase

e. Reverse transcriptase

92. Select from the list a quantitative characteristic of Brownian motion.

a. Coefficient of friction

b. Average particle displacement over time

c. Resistance of the medium

d. Coefficient of proportionality

e. Diffusion coefficient

93. What value is used when calculating the osmotic pressure of electrolyte solutions according to the Van 't Hoff's law?

a. Osmotic coefficient

b. Ebullioscopic constant

c. Isotonic coefficient

d. Cryoscopic constant

e. Activity coefficient

94. A sample of medicinal raw material was inoculated on the Sabouraud medium in order to detect phytopathogenic microorganisms in it. What microorganisms are detected this way?

a. Protozoa

b. Actinomycetes

c. Bacteria

d. Viruses

e. Fungi

95. Phellogen forms from pericycle or ground tissue that develops meristematic activity. What type of tissue is phellogen?

a. Dermal

b. Meristematic

c. Vascular

d. Mechanical

e. Secretory

96. On day 20 after a massive hemorrhage, the patient with an injury to the subclavian artery underwent a blood test. What blood test findings indicate an increase in erythropoiesis?

- a. Poikilocytosis
- b. Reticulocytosis**
- c. Anisochromia
- d. Hypochromia
- e. Anisocytosis

97. What compound is a base for organic dyes and belongs to isolated polynuclear arenes?

- a. Triphenylmethane**
- b. Anthracene
- c. Benzene
- d. Cumene
- e. Phenanthrene

98. What fluid will cause plasmolysis of human blood cells, if it is mistakenly administered intravenously?

- a. 3.5% glucose solution
- b. 0.9% NaCl solution
- c. Distilled water
- d. 3.5% NaCl solution**
- e. 0.9% glucose solution

99. Spore formation helps microbes survive in the environment. What microorganisms are spore formers?

- a. Peptococcus
- b. Peptostreptococcus
- c. Bacteroides
- d. Staphylococcus
- e. Clostridium**

100. What titrimetric methods can be used for quantification of streptocide (sulfanilamide, a primary aromatic amine) in a drug?

- a. Complexonometry, nitritometry
- b. Bromatometry, nitritometry**
- c. Permanganometry, bromatometry
- d. Nitritometry, argentometry
- e. Bromatometry, complexonometry

101. What is the typical sign of the initial stage of acute renal failure?

- a. Nocturia
- b. Dysuria
- c. Polyuria
- d. Pollakiuria
- e. Anuria**

102. What substance is a unique accumulator, donor, and transformer of energy within the body?

- a. Adenosine triphosphate**
- b. Succinyl-CoA
- c. Phosphoenolpyruvate
- d. Creatine phosphate
- e. Acetyl-CoA

103. Interleukin-1 is one of the secondary pyrogens in a fever. What cells are the main producers of this pyrogen?

- a. Macrophages**
- b. Platelets
- c. Tissue basophils
- d. Lymphocytes
- e. Eosinophils

104. Bacteriology of secretions from the patient's wound, stained using the Gram technique, revealed purple spherical microorganisms, arranged like a grape cluster. What microorganisms are the most likely cause of this disease?

- a. *S. aureus*
- b. *Salmonella typhimurium*
- c. *E. coli*
- d. *Neisseria*
- e. *Proteus vulgaris*

105. A 35-year-old patient complains of intense thirst, headache, and irritability. The 24-hour fluid intake is 9 liters. The 24-hour diuresis is increased. The patient was diagnosed with diabetes insipidus. This pathology is associated with impaired production of a certain hormone. Name this hormone.

- a. Glucocorticoids
- b. Aldosterone
- c. Vasopressin
- d. Catecholamines
- e. Thyroxine

106. A 65-year-old man has been diagnosed with benign prostatic hyperplasia. What adrenoblocker should he be prescribed?

- a. Doxazosin mesylate
- b. Adrenaline tartrate
- c. -
- d. Metoprolol
- e. Propranolol hydrochloride

107. A pharmaceutical company is developing a new antitumor drug that targets an enzyme that takes part in DNA replication. What enzyme is targeted by this drug?

- a. RNA polymerase
- b. Aminoacyl-tRNA synthetase
- c. Topoisomerase
- d. Peptidyl transferase
- e. Reverse transcriptase

108. What is propene structural formula?

- a.  $\text{CH}_3\text{-CH=CH-CH}_3$
- b.  $\text{CH}_3\text{-CH}_2\text{-CH=CH-CH}_3$
- c.  $\text{CH}_3\text{-CH}_2\text{-CH}_3$
- d. -
- e.  $\text{CH}_3\text{-CH=CH}_2$

109. A Gram-stained smear shows large oval violet cells that form pseudomycelium. Name these microorganisms.

- a. *Penicillium* fungi
- b. *Plasmodium malariae*
- c. Actinomycetales
- d. *Mucor* fungi
- e. *Candida* fungi

110. Species pectorales herbal tea contains pieces of bright yellow, sweet-tasting roots. What medicinal plant is it?

- a. *Acorus calamus*
- b. *Glycyrrhiza glabra*
- c. *Althaea officinalis*
- d. *Plantago major*
- e. *Valeriana officinalis*

111. Allopurinol is used to reduce the formation of uric acid in the treatment of gout. What enzyme is inhibited by this medicine?

- a. Arginase
- b. Lactate dehydrogenase
- c. Amylase
- d. Xanthine oxidase
- e. Catalase

112. An alkali was added into the solution being analyzed. When heated, the solution produced a gas. This gas changes the color of a moist litmus paper from red to blue, which indicates the presence of the following ions in the solution:

- a.  $\text{NH}_4^+$
- b.  $\text{Cl}^-$
- c.  $\text{Pb}^{2+}$
- d.  $\text{Bi}^{3+}$
- e.  $\text{CO}_3^{2-}$

113. After examination, a child was diagnosed with scarlet fever. What microorganism is the causative agent of this disease?

- a. Actinomycece
- b. Streptococcus
- c. Meningococcus
- d. Klebsiella
- e. Staphylococcus

114. What monomer is the basis for natural rubber?

- a. Propene
- b. 1-Butyne
- c. Ethene
- d. Divinyl
- e. Isoprene

115. After evaporation of the solution that is being analyzed, the remaining dry residue turns the colorless flame of the burner purple. What ions are present in the solution, as indicated by this reaction?

- a. Sodium ions
- b. Barium ions
- c. Lithium ions
- d. Ammonium ions
- e. Potassium ions

116. Polarimetry is used for determining optically active substances. What substance can be determined, using this method?

- a. Glucose
- b. Potassium iodide
- c. Copper sulfate
- d. Sodium chloride
- e. Calcium nitrate

117. A patient with arterial hypotension accompanied by collapse was administered phenylephrine hydrochloride to increase the blood pressure. What receptors are stimulated by this drug?

- a. Nicotinic acetylcholine receptors
- b. Angiotensin receptors
- c. alpha-adrenergic receptors
- d. beta-adrenergic receptors
- e. Muscarinic acetylcholine receptors

118. When carbohydrate intake is excessive, insulin stimulates conversion of carbohydrates into lipids in the cells of adipose tissue. What biochemical process enables this conversion?

- a. Gluconeogenesis
- b. Heme synthesis



c. Lipolysis

d. Synthesis of higher fatty acids

e. Uric acid synthesis

119. Hepatitis B patients and hepatitis B carriers cannot be potential donors, because there is a risk of transmitting the infection to the recipient along with blood and blood products. What transmission route is characteristic of this infection?

a. Alimentary transmission

b. Airborne-dust transmission

c. Airborne-droplet transmission

d. Parenteral transmission

e. Arthropod-borne transmission

120. Microscopy of plants detects parenchymal cells with thin membranes, a large nucleus, and a large number of ribosomes. What tissue is it?

a. Secretory tissue

b. Meristematic tissue

c. Mechanical tissue

d. Parenchyma

e. Dermal tissue

121. Morphological analysis shows that the length of a leaf blade exceeds 1.5-2 times its width and the widest part is located closer to the base. What shape of the leaf blade is it?

a. Lanceolate

b. Ovate

c. Linear

d. Narrowly ovate

e. Elliptic

122. What law underlies the method of spectrophotometry in the ultraviolet region of the spectrum?

a. Faraday law

b. Stokes-Lommel law

c. Beer-Bouguer-Lambert law

d. Ohm law

e. Rayleigh law

123. A 45-year-old man has been hospitalized with intense pain in the right hypochondrium. He was diagnosed with cholelithiasis accompanied by biliary colic. What drug should be prescribed in this case to eliminate the pain syndrome?

a. -

b. Pancreatin

c. Drotaverine hydrochloride

d. Bisacodyl

e. Almagel

124. Microbiological testing of vaginal suppositories shows that they do not meet the requirements of the Pharmacopoeia. What microflora was detected in the suppositories, causing this conclusion?

a. Sarcina

b. Lactobacilli

c. Micrococci

d. Tetracocci

e. Pseudomonas aeruginosa

125. Administration of adrenaline increases glucose levels in the blood. What process is mainly activated in this case?

a. Pentose phosphate pathway

b. Lipogenesis

c. Glycogenesis

d. Glycogenolysis

e. Gluconeogenesis

126. Name the phenomenon when aerosol particles move in the direction of decreasing temperature.

a. Sedimentation

**b. Thermophoresis**

c. Peptization

d. Photophoresis

e. Electrophoresis

127. A patient has been hospitalized with signs of ascites. The doctor prescribed the patient spironolactone to enhance the diuretic effect of hydrochlorothiazide. What effect does this drug have besides its diuretic effect?

a. Antispasmodic

b. Analgesic

c. Sedative

**d. Potassium-sparing**

e. Irritant

128. After a long course of antibiotic therapy, the patient developed a complication characterized by the formation of white coating on the oral mucosa. Microscopy of swabs from the affected areas reveals oval budding microorganisms. Inoculation of the obtained material on the Sabouraud medium results in growth of smooth white colonies. What drug should be used for the etiotropic treatment of this disease?

a. Isoniazid

**b. Fluconazole**

c. Doxycycline

d. Albendazole

e. Acyclovir

129. What electrode can be used as an indicator electrode in titration of bases?

a. Silver chloride electrode

b. Calomel electrode

**c. Glass electrode**

d. Quinhydrone electrode

e. Platinum electrode

130. What is the effect of electron-accepting substituents (type II substituents) on the course of electrophilic substitution (SE) reactions in arenes?

a. They speed up the reaction and are ortho- and para-directors

**b. They slow down the reaction and are meta-directors**

c. They speed up the reaction and are meta-directors

d. They slow down the reaction and are ortho- and para-directors

e. They have no effect on the reaction

131. What titrimetric method of analysis can be used for quantification of magnesium chlorides in a mixture that contains both potassium and magnesium chlorides?

**a. Complexonometry**

b. Argentometry

c. Permanganatometry

d. Mercurimetry

e. Nitritometry

132. What method of microspecimen staining can be used to detect Mycobacterium tuberculosis?

a. Burri-Gins stain

b. Gram stain

c. Romanowsky-Giemsa stain

d. Neisser stain

**e. Ziehl-Nielsen stain**

133. During practice, a student was tasked with classifying plants, dividing them into monocotyledons and dicotyledons. What family of plants belongs to the monocotyledons?

- a. Poaceae
- b. Brassicaceae
- c. Lamiaceae
- d. Rosaceae
- e. Fabaceae

134. What reagent can be used for identification of lead cations according to the State Pharmacopoeia of Ukraine?

- a. Potassium iodide
- b. Sodium hydroxide
- c. Urea
- d. Sodium sulfite
- e. Formaldehyde solution

135. What antiprotozoal drug has anti-Helicobacter pylori effect?

- a. Isoniazid
- b. Rifampicin
- c. -
- d. Metronidazole
- e. Albendazole

136. What heterocycle has acidophobic properties?

- a. Pyrrole
- b. Quinoline
- c. Pteridine
- d. Thiophene
- e. Pyrimidine

137. What is benzene formula?

- a. C<sub>6</sub>H<sub>10</sub>
- b. C<sub>10</sub>H<sub>8</sub>
- c. C<sub>6</sub>H<sub>6</sub>
- d. C<sub>6</sub>H<sub>8</sub>
- e. C<sub>4</sub>H<sub>4</sub>

138. Ledum palustre leaves are leathery, with a flat elongated leaf blade, curved downward edges, and brown hairs on the underside. What family does this plant belong to?

- a. Lamiaceae
- b. Brassicaceae
- c. Ericaceae
- d. Fabaceae
- e. Rosaceae

139. For tetanus prevention a certain toxin is used. This toxin is being inactivated with formaldehyde (0.4%) under the temperature of 39°C over the course of 4 weeks. Name the resulting preparation.

- a. Killed vaccine
- b. Adjuvant
- c. Antitoxic serum
- d. Immunoglobulin
- e. Anatoxin

140. A patient has been admitted to the hematology department of a hospital. He has history of frequent cases of acute respiratory viral infections and tonsillitis. Examination reveals enlarged lymph nodes. Blood test results: anemia, lymphocytosis, a small number of lymphoblasts, and Gumprecht shadows in the blood smear. What pathology has most likely occurred in this patient?

- a. Agranulocytosis
- b. Lymphogranulomatosis

- c. Multiple myeloma
- d. Chronic lymphocytic leukemia
- e. Chronic myeloid leukemia

141. What type of pharmaceutical interaction is it, when absorption of tetracycline drugs becomes reduced if they are taken simultaneously with antacids?

- a. Pharmacodynamic incompatibility
- b. Pharmaceutical incompatibility
- c. Pharmacokinetic incompatibility
- d. Synergism
- e. Functional antagonism

142. What bioactive peptide is a major intracellular antioxidant and performs coenzyme functions?

- a. Liberine
- b. Bradykinin
- c. Hemoglobin
- d. Glutathione
- e. Oxytocin

143. A 50-year-old patient has been hospitalized into the intensive care unit with complaints of weakness, shortness of breath, and constricting pain behind the sternum. Examination reveals that the patient's condition is moderately severe, heart rate - 80/min, blood pressure - 130/85 mm Hg. ECG shows deep Q waves and ST segment elevation. Acutely increased activity of AST, CPK-MB, and troponins is observed in the blood. What pathological condition can be characterized by the described symptoms and laboratory test results?

- a. Angina pectoris
- b. Pericarditis
- c. Myocardial infarction
- d. Pulmonary embolism
- e. Myocarditis

144. In human body, stable glucose levels are maintained by balanced levels of insulin and counterinsular hormones. What endocrine pathology causes development of persistent hypoglycemia?

- a. Cushing disease
- b. Thyrotoxicosis
- c. Acromegaly
- d. Pheochromocytoma
- e. Insulinoma

145. What H<sub>2</sub>-histamine blocker can be used to treat peptic ulcer disease of the stomach with increased secretory function?

- a. Famotidine
- b. Omeprazole
- c. Atropine sulfate
- d. Drotaverine hydrochloride
- e. Levocetirizine

146. What is the mechanism of action of antiviral drug acyclovir?

- a. Inhibition of nucleic acid synthesis
- b. Inhibition of protein synthesis
- c. Blockade of cell wall synthesis
- d. Increasing the cell membrane permeability
- e. Antagonism with para-aminobenzoic acid

147. A person has been hospitalized with the diagnosis of malaria. What route of infection transmission is characteristic of this disease?

- a. Direct contact transmission
- b. Arthropod-borne transmission

- c. Indirect contact transmission
- d. Fecal-oral transmission
- e. Airborne and droplet transmission

148. The synthesis of thyroid hormones is carried out from tyrosine in a special protein of the thyroid gland. Name this protein.

- a. Histone
- b. Interferon
- c. Immunoglobulin
- d. Thyroglobulin
- e. Albumin

149. After adding a barium chloride solution to the solution being analyzed, a white precipitate, insoluble in acids and alkalis, formed. What anions are present in the analyzed solution?

- a. Carbonate anions
- b. Phosphate anions
- c. Chloride anions
- d. Sulfate anions
- e. Nitrate anions

150. What structures of a flower originate from the stem?

- a. Receptacle and perianth
- b. Stamens and pistils
- c. Calyx and stamens
- d. Calyx and corolla
- e. Pedicel and receptacle