STATE NON-PROFIT ENTERPRISE
«TESTING BOARD FOR PROFESSIONAL COMPETENCE ASSESSMENT OF HIGHER EDUCATION TRAINEES IN MEDICINE AND PHARMACY AT THE MINISTRY OF HEALTH OF UKRAINE»

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TEST ITEMS FOR THE UNIFIED STATE QUALIFICATION EXAM

STAGE 1

ENGLISH LANGUAGE PROFICIENCY TEST

Specialty «PHARMACY, INDUSTRIAL PHARMACY»

Specialization «PHARMACY»

I. Read the text and answer 10 questions to it.

Tackling dietary disorders

Tackling dietary disorders By establishing nutrition as an experimental science, Funk's work paved the way for research into cures for disorders such as rickets, which ravaged populations in the 19th and early 20th centuries, contributing to high child mortality, especially in newly industrialized cities. Rickets is a skeletal disease that produces weak, soft bones, stunted growth, and skeletal deformities in young children. Finding a cure had long challenged physicians, and diet had not been considered until British biochemist Edward Millenby experimented with dogs diets between 1918 and 1921. Inspired by the work of Funk and McCollum, Mellenby found that when fed on oatmeal alone, puppies developed rickets, but when given a diet rich in cod-liver oil or suet, they recovered. He had demonstrated beyond doubt that the disease is the product of a dietary deficiency. Mellenby explained that in the absence of "accessory food factors"(which we now know are vitamins), the phytic acid present in the oats suppressed the absorption of calcium and phosphorus (needed for healthy bone growth). However, the vitamin D in fish (and in milk, eggs, and suet) helps that absorption. His work changed attitudes towards the prevention of rickets so dramatically that by the early 1930s, London was thought to be free from the disease. Pellagra, whose symptoms include dermatitis, diarrhoea, mouth sores, and dementia, affected three million Americans between 1906 and 1940, causing 100,000 deaths in areas where maize was the dominant food crop. In the early 20th century, scientists assumed that maize either carried the disease or contained a toxic substance. However, pellagra wasn't prevalent in Mesoamerica, where maize had been a dietary staple for centuries. In 1914, the US government tasked physician Joseph Goldberger with finding a cure. Observing a higher incidence of pellagra among people with a poor diet, he tested a range of supplements. Goldberger concluded that a diet that included meat, milk, eggs, and legumes - or small amounts of brewer's yeast - prevented pellagra. The vitamin link was finally confirmed in 1937 when American biochemist Conrad Elvehjem demonstrated that niacin (vitamin B) cured the disease.

1. How did Edward Mellanby prove that diet was linked to rickets?

A. By using advanced imaging techniques on bones
B. By feeding different diets to groups of humans
C. By comparing the diets of children in different regions
D. By experimenting with the diets of dogs

2. How did Goldberger determine the link between diet and pellagra?

A. By observing cases in different geographical regions
B. By testing dietary supplements on affected individuals
C. By conducting blood tests on patients
D. By studying the genetic makeup of patients

II. Choose the right answer.

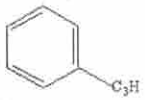
11. What compound can be synthesized from bromobenzene and bromomethane using the Wurtz-Fittig reaction?

A. o-Bromomethylbenzene
B. m-Bromomethylbenzene
C. Methylbenzene
D. Ethylbenzene
E. p-Bromomethylbenzene

12. Select pyridine among the listed compounds.

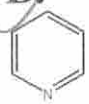
A.

B.



C.

D.



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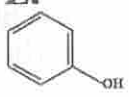

13. An unconscious person with signs of carbon monoxide poisoning has been evacuated by firefighters from a burning apartment. What type of hypoxia develops in such cases?

A. Circulatory hypoxia
B. Tissue hypoxia
C. Exertional hypoxia
D. Hemic hypoxia
E. Hypoxic hypoxia

14. What type of tautomerism is characteristic of five-membered heterocyclic compounds with two nitrogen heteroatoms?

A. Tautomerism of azoles
B. Keto-enol tautomerism
C. Lactam-lactim tautomerism
D. Nitro-aci-nitro tautomerism
E. Amine-imine tautomerism

15. A certain woody plant is widespread in Ukraine. Its inflorescence can be characterized by two types of flowers: marginal flowers are large, wheel-shaped, and sterile, while central flowers are small, bell-shaped, fertile, and produce red pyrenaria (coenocarp drupes). What plant is it?

A. *Viburnum opulus*
B. *Rhamnus cathartica*
C. *Hippophae rhamnoides*
D. *Frangula alnus*
E. —

16. A 27-year-old woman with diabetes mellitus and signs of increasing acidosis has been hospitalized. What process is the main cause of metabolic acidosis in type 1 diabetes mellitus?

3. Why was rickets no longer a significant issue in London by the early 1930s?

A. Genetic modification of food crops
B. Widespread vaccination programs
C. Changes in diet, including increased vitamin D intake
D. Improvement in living conditions

4. Choose the correct statement regarding Conrad Elvehjem's work on pellagra:

A. Elvehjem's research concluded that pellagra was primarily a genetic disorder
B. Elvehjem found that pellagra was caused by bacteria present in contaminated water
C. Elvehjem demonstrated that niacin (vitamin B) could cure pellagra
D. Elvehjem discovered that pellagra was caused by a lack of vitamin D

5. What was the main symptom of rickets in children?

A. Vision problems
B. Hearing loss
C. Respiratory issues
D. Soft, weak bones

6. What was the main cause of pellagra as identified by Joseph Goldberger?

A. A genetic disorder
B. Excessive sunlight exposure
C. Contaminated maize
D. A lack of specific nutrients

7. What major contribution did Funk's work make to the study of dietary disorders?

A. He established nutrition as an experimental science
B. He discovered the first vitamin
C. He proved that rickets was caused by a genetic mutation
D. He found the cure for pellagra

8. Which dietary component was found to help prevent rickets, according to Mellanby's research?

A. Phytic acid
B. Fish liver oil
C. Processed foods
D. Oatmeal

9. What was the primary source of niacin, the vitamin that cured pellagra?

A. Water, buckwheat, oatmeal
B. Fruits, rice, corn
C. Meat, milk, eggs, and legumes
D. Wheat, liver, water

10. What was the initial belief about the cause of pellagra before Goldberger's research?

A. It was caused by a lack of sunlight
B. It was caused by bacteria in contaminated water
C. It was due to a toxic substance in maize
D. It was a hereditary disease

II. Choose the right answer.

11. What compound can be synthesized from bromobenzene and bromomethane using the Wurtz-Fittig reaction?

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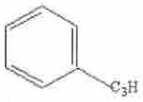

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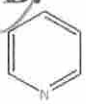

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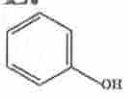

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A. Increased ammoniogenesis in the kidneys
B. Increased glycogen breakdown
C. Increased acidogenesis in the kidneys
D. Increased formation of triglycerides
E. Increased formation of ketone bodies

17. What propionic acid derivative can be prescribed for the treatment of inflammatory diseases?

A. Ibuprofen
B. Fentanyl
C. Meloxicam
D. Paracetamol
E. Prednisolone

18. What reagent must be used for identification of sodium cations in a sodium thiosulfate substance according to the regulations of the State Pharmacopoeia of Ukraine, second edition?

A. Potassium hexacyanoferrate (III)
B. Potassium pyroantimonate
C. Silver nitrate
D. Ammonium oxalate
E. Barium chloride

19. A heated nichrome wire was immersed in the solution that is being studied and then placed in the flame of a gas burner. The flame colored yellow-green as a result. What cations are present in the solution?

A. Barium cations
B. Potassium cations
C. Calcium cations
D. Sodium cations
E. Ammonium cations

20. 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. Diphenhydramine hydrochloride
B. Atropine sulfate
C. Adrenaline tartrate
D. Propranolol hydrochloride
E. Furosemide

21. An intern pharmacist needs to choose a vitamin supplement that is an oil solution for internal use, indicated for the treatment of osteoporosis. What would you recommend in this case?

A. Menadione
B. Folic acid
C. Ergocalciferol
D. Retinol acetate
E. Ascorbic acid

22. What anions are present in the solution, if it colors violet when iron (III) chloride reagent is added into it?

A. Carbonate anions
B. Salicylate anions
C. Acetate anions
D. Nitrate anions
E. Benzoate anions

23. Morphological analysis of fruits of *Lamiaceae* family plants shows that they are coenocarp, dry, and consist of 4 nutlets protected by a calyx. What is the name of this type of fruit?

A. Capsule
B. Coenobium
C. Fraga
D. Hesperidium
E. Silique

24. A maternity hospital plans to immunize its healthcare personnel against hepatitis B. What vaccine will be used for immunization in

this case?

A. Genetically engineered vaccine
B. Live vaccine
C. Chemical vaccine
D. Anatoxin
E. Killed vaccine

25. Which one of the listed heterocycles is a condensed heterocycle?

A. Pyridine
B. Pyrrole
C. Pyrazole
D. Pyrimidine
E. Purine

26. When ascending into the mountains, a group of tourists developed signs of mountain sickness. What factor plays the main role in the development of this pathology?

A. The difference in day and night temperatures
B. Extreme physical exertion
C. Decreased partial pressure of oxygen in the air
D. Solar radiation
E. The rate of altitude gain

27. A certain *Asteraceae* species has downy silvery leaves. Its long petiolate basal leaves are tripinnatisect and divided into lanceolate segments, while its stem leaves are apical, sessile, narrowly lanceolate, and simple. Its flowers are yellow, tubular, composed into small flat capitula and arranged into a long panicle. What plant species is it?

A. *Tanacetum vulgare*
B. *Matricaria chamomilla*
C. *Bidens tripartita*
D. *Helichrysum arenarium*
E. *Artemisia absinthium*

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

A. Streptococcus
B. Actinomycete
C. Klebsiella
D. Meningococcus
E. Staphylococcus

29. In production of pharmaceuticals, compounds that increase the stability of medicines play an important role. Surfactants and high-molecular substances that are used to increase the stability of concentrated emulsions and prevent their stratification are called:

A. Coagulators
B. Solubilizers
C. Emulsifiers
D. Activators
E. Peptizers

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

A. 15 mmol/L
B. 20 mmol/L
C. 5 mmol/L
D. 10 mmol/L
E. 1 mmol/L

31. What eicosanoids stimulate uterine contractions during childbirth and play a role in development of inflammatory reactions?

A. Cytokines
B. Enkephalins
C. Proteases
D. Endorphins
E. Prostaglandins

32. What is the position in the quinoline molecule, at which nucleophilic substitution reactions

would occur?

A. 3
B. 6
C. 2
D. 5
E. 4

33. A 48-year-old patient was admitted to the nephrology department of a hospital with complaints of facial edema in the morning, headache, and elevated blood pressure of 155/95 mm Hg. What is the primary pathophysiological mechanism underlying arterial hypertension in chronic kidney diseases?

A. Activation of the renin-angiotensin system
B. Increased sodium reabsorption in the kidneys
C. Increased synthesis of angiotensin II
D. Activation of the aldosterone-vasopressin system
E. Activation of the sympathoadrenal system

34. What titrimetric method of analysis can be used to determine the total content of $CaCl_2$ and $NaBr$ in a solution?

A. Alkalimetry
B. Argentometry
C. Iodometry
D. Permanganometry
E. Acidimetry

35. A doctor has prescribed metformin to a patient diagnosed with diabetes mellitus. What is the main mechanism of the hypoglycemic action of this drug?

A. Stimulation of insulin secretion by pancreatic β-cells
B. Inhibition of dipeptidyl peptidase-4 activity
C. Decreased formation of glucose in the liver
D. Activation of glucagon-like peptide-1 receptors
E. Inhibition of α-glucosidase activity

36. 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. Transferases
B. Ligases
C. Oxidoreductases
D. Isomerases
E. Lyases

37. What phases are in equilibrium at the eutectic point of the melting diagram of a mixture of menthol and camphor that can be used as a solvent for some medicinal substances that are poorly soluble in water?

A. Inclusions of large camphor crystals in a fine mixture of menthol crystals
B. Eutectic melt, menthol crystals, camphor crystals
C. Crystals of a chemical compound that formed as a result of interaction between menthol and camphor
D. Water, menthol crystals, camphor crystals
E. Inclusions of large menthol crystals in a fine mixture of camphor crystals

38. A patient diagnosed with arterial hypertension has poor tolerance of angiotensin-converting enzyme inhibitors. Help an intern doctor choose another drug that

has an effect on the renin-angiotensin-aldosterone system and can be prescribed for this patient.

A. Lisinopril
B. Propranolol hydrochloride
C. Nifedipine
D. Doxazosin mesylate
E. Losartan

39. What H_2-histamine blocker can be used to treat peptic ulcer disease of the stomach with increased secretory function?

A. Metoclopramide hydrochloride
B. Atropine sulfate
C. Famotidine
D. Drotaverine hydrochloride
E. Omeprazole

40. An elderly patient with insomnia has been prescribed a medicine containing melatonin. This hormone is synthesized from a certain amino acid in the human body. Name this amino acid.

A. Tyrosine
B. Proline
C. Tryptophan
D. Valine
E. Lysine

41. Morphological analysis of a flower reveals that it has a reduced perianth in the form of two membranes — lodicules. Its stamens have long staminal filaments. Its pistil has a feathery stigma. This description is characteristic of the plants that belong to the following family:

A. *Pinaceae*
B. *Poaceae*
C. *Lamiaceae*
D. *Alliaceae*
E. *Convallariaceae*

42. A nasal mucus sample was collected for a rapid influenza diagnostic test from a patient with fever, intoxication, and clinical signs of a respiratory infection. The rapid test revealed influenza A virus antigens in the collected material. What antiviral drug should be recommended for the treatment in this case?

A. Paracetamol
B. Acyclovir
C. Amoxicillin
D. Oseltamivir
E. Fluconazole

43. A doctor has prescribed a hypnotic and sedative drug to the patient. The drug is a cyclopyrrolone derivative and a specific benzodiazepine receptor agonist. Select this drug from the list.

A. Caffeine citrate
B. Fentanyl
C. Zopiclone
D. Levodopa
E. Sodium valproate

44. A patient diagnosed with arterial hypertension has been prescribed lisinopril. What is the mechanism of action of this drug?

A. Stimulation of α_2-adrenergic receptors
B. Inhibition of angiotensin-converting enzyme
C. Blockade of β-adrenergic receptors
D. Stimulation of β-adrenergic receptors
E. Blockade of calcium channels in vascular smooth muscle

45. A patient with liver cirrhosis presents with impaired consciousness and neurological symptoms, caused by the toxic effect of ammonia on the central

nervous system. What is the main mechanism in the development of ammonia toxicity?

A. Excessive formation of γ-aminobutyric acid
B. Inhibition of dopamine synthesis
C. Ornithine cycle disorder
D. Activation of polyamines
E. Reduced levels of α-ketoglutarate in neurons

46. What happens with the osmotic pressure of a surfactant solution after the critical micelle concentration (CMC) is reached?

A. It remains unchanged
B. It stops increasing and remains practically unchanged or increases very slightly
C. The dependence of the osmotic pressure on the concentration within the range of C>CMC is the same as within the range of C<CMC
D. It begins to decrease rapidly due to the process of micelle formation
E. It begins to increase rapidly

47. A 35-year-old woman undergoes prolonged fasting to lose weight, which activates gluconeogenesis in her body to maintain the blood glucose levels. What is the key enzyme in this process?

A. Phosphofructokinase
B. Glucokinase
C. Glycogen phosphorylase
D. Pyruvate carboxylase
E. Pyruvate dehydrogenase

48. 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. CO_3^{2-}
B. NH_4^+
C. Bi^{3+}
D. Pb^{2+}
E. Cl^-

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

A. Mesophytes
B. Hygrophytes
C. Succulents
D. Hydrophytes
E. Xerophytes

50. A pharmaceutical company has established the biotechnological process for obtaining bioactive substances, produced by certain species of microorganisms. For the effective production of drugs, it is necessary to store the producer cultures in a viable state for a long time. What method is used for long-term storage of producer microorganisms?

A. Fermentation
B. Lyophilization
C. Filtering
D. Freezing
E. Autoclaving