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

The discovery of insulin

The discovery of insulin In May 1921, Banting and Best began to conduct experiments on dogs. They removed the pancreas of some dogs and tied off the pancreatic duct of others. The dogs whose pancreas had been removed altogether developed diabetes, as expected, while the dogs whose ducts had been tied did not. While the pancreatic cells that produced digestive secretions degenerated in the dogs whose pancreatic duct had been tied, the islets of Langerhans remained undamaged. Clearly, the islets of Langerhans produced the secretions that prevented diabetes occurring. Banting and Best wanted to extract and isolate these secretions, but it was difficult to keep the dogs alive long enough to carry out tests.

After numerous setbacks, resulting in the deaths of several dogs, they succeeded in keeping a severely diabetic dog alive with injections of an extract made from the tied-off pancreas. They called this extract isletin. Their next challenge was to find a way of producing enough extract to make it a practicable treatment for diabetes.

Realizing that relying on a supply of dogs was going to hold back research, Banting and Best moved on to using the pancreas of cows, obtained from a local slaughterhouse. They managed to extract a substance that contained a greater amount of the active ingredient and injected it into one of the laboratory dogs that had had its pancreas removed. The dog's blood sugar dropped significantly.

Human testing

At the end of 1921, Macleod invited James Collip, a skilled biochemist to help purify Banting and Best pancreatic extract for clinical testing in humans. On 11 January 1922, the extract was injected into 14-year-old Leonard Thompson a diabetic patient who was close to death, at the Toronto Gene Hospital. The first test proved disappointing, but it was repeated with a purer version of the extract around two weeks later, this time with much better results.

Thompson's blood sugar returned to normal levels and his other symptoms abated.

'In May 1922, Macleod delivered a paper, "The Effects Produced on Diabetes by Extracts of Pancreas", on behalf of the team at the annual conference of the Association of American Physicians. He received a standing ovation. The paper used the word "insulin"for the first time.

1. Who conducted experiments on dogs to investigate the role of pancreatic secretions in preventing diabetes?

A. Banting and Best
B. Thompson and Macleod
C. Langerhans and Collip
D. Gene and Extract
E. —

2. What happened to dogs whose pancreatic ducts were tied off in the experiments?

A. They remained healthy
B. They developed diabetes
C. They produced more insulin
D. They died
E. —

3. What did Banting and Best call the extract they obtained from the tied-off pancreas of dogs?

A. Isletin
B. Insulin
C. Isletix
D. Langerhansin
E. —

4. Why did Banting and Best switch from using dogs to using cow pancreases for their research?

A. Cow pancreases contained a greater amount of the active ingredient
B. Dogs became expensive
C. Dogs were hard to keep alive
D. Dogs were not available
E. —-

5. Who was invited to help purify Banting and Best's pancreatic extract for human testing in 1922?

A. James Collip
B. Leonard Thompson
C. Isletin researcher
D. Gene Hospital specialist
E. —

6. How did Leonard Thompson's condition change in the second test with a purer version of the pancreatic extract?

A. His blood sugar returned to normal levels
B. His symptoms worsened
C. He developed new symptoms
D. No change in his condition
E. —

7. What did Macleod's paper at the Association of American Physicians conference in May 1922 introduce for the first time?

A. The word "insulin"
B. A new research method
C. A different treatment for diabetes
D. A revolutionary medical device
E. —

8. Why was it challenging to conduct research using dogs for insulin extraction?

A. Dogs could not survive the experiments
B. Dogs were too expensive
C. Dogs did not have the necessary islets of Langerhans
D. Dogs had another type of insulin production
E. —

9. The dogs used in the experiments survived long enough for the tests to be conducted successfully.

A. False
B. True
C. Not given
D. -
E. -

10. Banting and Best initially conducted experiments on cats to investigate the role of pancreatic secretions in

preventing diabetes.

A. Not given
B. False
C. True
D. -
E. -

11. What common property of cation compounds Al^{3+}, Zn^{2+}, Cr^{3+}, Sn^{2+} unites them within the IV analytical group (acid-base classification)?

A. Amphotericity of hydroxides
B. Insolubility of salts in water
C. Good solubility of some salts
D. Solubility of hydroxides in acids
E. Solubility of hydroxides in an excess ammonia solution

12. What reaction can be classified as a pseudo-first-order reaction?

A. Hydrolysis of sucrose
B. Etherification
C. Saponification
D. Neutralization
E. Combustion

13. Elevated levels of ketone bodies were detected in the blood of a patient with diabetes mellitus. Ketone bodies are synthesized from the following compound:

A. Acetyl-CoA
B. Succinate
C. Lactate
D. Glucose
E. Malate

14. To what electrode will the protein particle move during electrophoresis, if its isoelectric point is 4.0 and the pH of the solution is 5.0?

A. To the anode
B. To the cathode
C. First to the cathode, and then to the anode
D. First to the anode, and then to the cathode
E. There will be no movement

15. A patient with Cushing syndrome has persistent hyperglycemia and glucosuria. In this case, increased synthesis and secretion of a certain hormone can be observed. What hormone is it?

A. Cortisol
B. Adrenaline
C. Glucagon
D. Thyroxine
E. Insulin

16. A 53-year-old patient has been hospitalized with complaints of dyspeptic disorders and melena. Objectively, the patient has splenomegaly, ascites, and dilated superficial veins of the anterior abdominal wall. What syndrome can be characterized by these symptoms?

A. Portal hypertension
B. Cholemia
C. Acholia
D. Suprahepatic jaundice
E. Arterial hypotension

17. What type of fruit is characteristic of *Atropa belladonna*?

A. Berry
B. Capsule
C. Follicle
D. Silique
E. Hesperidium

18. The majority of live vaccines are made from microbes with reduced virulence. What is the name of such vaccines?

A. Attenuated vaccines
B. Denatured vaccines
C. Anatoxins
D. Adsorbed vaccines
E. Adjuvant vaccines

19. A patient has been warned that his prescribed drug can cause a cough. What drug is it?

A. Lisinopril
B. Clophelin (Clonidine)
C. Phenihydine (Nifedipine)
D. Dichlothiazide (Hydrochlorothiazide)
E. Metoprolol

20. What is the mechanism of action of beta-lactam antibiotics?

A. Inhibition of cell wall synthesis
B. Inhibition of cytoplasmic membrane synthesis
C. Inhibition of protein synthesis in ribosomes
D. Disruption of DNA synthesis
E. Inhibition of DNA gyrase

21. Various types of immunobiological agents are used for immunoprophylaxis of infectious diseases. What type of prophylaxis involves the use of immune sera and gamma globulins?

A. Specific passive
B. Specific active
C. Non-specific
D. General
E. Immunotropic

22. Microscopy shows that basidia with basidiospores form on the hymenium. What division do these fungi belong to?

A. *Basidiomycota*
B. *Ascomycota*
C. *Zygomycota*
D. *Chytridiomycota*
E. *Lychenophyta*

23. A woman in ketoacidotic coma has loud rapid respiration: a deep inspiration is followed by a forced expiration with active participation of expiratory muscles. What type of pathological respiration is it?

A. Kussmaul
B. Cheyne-Stokes
C. Gasping
D. Stenotic
E. Biot

24. A patient developed neuritis of the facial nerve after five months of tuberculosis treatment. What drug has caused this side effect?

A. Isoniazid
B. Benzylpenicillin sodium
C. Ceftriaxone
D. Rifampicin
E. Para-aminosalicylate sodium

25. What hormonal drug is used in cases of atonic uterine bleeding?

A. Oxytocin
B. L-thyroxine
C. Insulin
D. Prednisolone
E. Progesterone

26. What reagent can be used to confirm the presence of a phenolic hydroxyl group in the molecule of vitamin B_6 (pyridoxine)?

A. $FeCl_3$ (purple coloring)
B. $NaCl$ (yellow coloring)
C. $NaOH$ (blue coloring)
D. H_2SO_4 (white precipitate)
E. HCl (no precipitate)

27. Select a nucleophile among the particles and molecules given below.

A. $\ddot{N}H_3$
B. CH_3Cl
C. NO_2^+
D. H^+
E. $AlCl_3$

28. Which one of the listed compounds belongs to conjugated dienes?

A. $CH_2 = CH - CH = CH - CH_3$
B. $CH_2 = C = CH_2$
C. $CH_2 = C = CH - CH_2 - CH_3$
D. $CH_2 = CH - C(CH_3)_2 - CH = CH_2$
E. $CH_2 = CH - CH_2 - CH = CH_2$

29. What cation of the third analytical group can be precipitated using the group reagent H_2SO_4 only in the presence of ethanol (binds water and concentrates the solution)?

A. Ca^{2+}
B. Sr^{2+}
C. Ba^{2+}
D. K^+
E. Na^+

30. To stop a fever, the patient was prescribed a centrally acting non-narcotic analgesic that, unlike the other drugs in this group, has relatively weak anti-inflammatory effect. What drug is it?

A. Paracetamol
B. Nurofen (Ibuprofen)
C. Aspirin
D. Indomethacin
E. Analgin (Metamizole)

31. When a galvanic cell operates under standard conditions, the chemical energy of the redox process transforms into the following type of energy:

A. Electrical energy
B. Mechanical energy
C. Electromagnetic energy
D. Nuclear energy
E. Thermal energy

32. What transformation is accompanied by an increase in entropy?

A. $NH_4 - NO_2 - (solid) = N_2(gas) + 2H_2O(gas)$
B. $CaO(solid) + CO_2(gas) = CaCO_3(solid)$
C. $N_2(gas) + O_2(gas) = 2NO(gas)$
D. $2H_2S(gas) + 3O_2(gas) = 2SO_2(gas) + 2H_2O(gas)$
E. $C_2H_2(gas) + H_2(gas) = C_2H_4(gas)$

33. Isotonicity is one of the requirements for infusion solutions. What aqueous salt solution is used in clinical practice as an isotonic solution?

A. 0.85–0.90% solution of $NaCl$
B. 10% solution of $NaCl$
C. 4.5–5.0% glucose solution
D. 10% solution of $CaCl_2$
E. 0.9% solution of $MgCl_2$

34. An analytical chemist conducts a qualitative analysis of cations of the second group. What reagent can be used to separate lead chloride from chlorides of other cations of the second group?

A. Hot water
B. Sodium chloride
C. Sodium hydroxide
D. Hydrochloric acid
E. Ammonia

35. Cosmetic cream against mimic wrinkles contains "vitamin Q10— ubiquinone. What is the metabolic role of this vitamin-like substance?

A. It is a component of the mitochondrial respiratory chain
B. It stimulates collagen synthesis
C. It regulates differentiation of epithelial cells
D. It regulates water-salt exchange
E. It decreases permeability of cell membranes

36. Action of a number of drugs is based on the effect of competitive inhibition of enzyme activity. Name its characteristic feature.

A. Inhibitor is a structural analogue of the substrate
B. Inhibitor is a structural analogue of the enzyme
C. Inhibition degree does not depend on the substrate concentration
D. Inhibitor has no effect on the enzyme's affinity for its substrate
E. Inhibitor forms strong covalent bonds with the active site of the enzyme

37. A patient has been hospitalized with signs of carbon monoxide poisoning. What type of hypoxia is characteristic of this condition?

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

38. Sclerenchyma fibers, formed by procambium or parenchyma around vascular bundles or secretory cavities, strengthen and protect them. What type of fibers is it?

A. Perivascular fibers
B. Pericyclic fibers
C. Cortical fibers
D. Phloem fibers
E. Xylem fibers

39. Pathogenic bacteria in the human body can form structures that protect them from phagocytosis. Name these structures.

A. Capsule
B. Flagella
C. Spores
D. Inclusions
E. Mesosomes

40. What type of cardiac arrhythmia occurs as a result of simultaneous disruption of excitability and conduction functions?

A. Atrial fibrillation
B. Respiratory arrhythmia
C. Extrasystole
D. Sinus tachycardia
E. Atrioventricular block

41. Water samples were received by a bacteriological laboratory for determining their coli index. What is the coli index?

A. Number of *Escherichia coli* in 1 liter of water
B. Number of staphylococci in 1 liter of water
C. Number of pseudomonads in 1 liter of water
D. Number of enterococci in 1 liter of water
E. Number of coliphages in 1 liter of water

42. During harvesting of a herbal raw material (belladonna), the plants had burns and patches of withering and rot. What microorganisms cause this kind of damage in plants?

A. Mycoplasma
B. Protozoa
C. Microfungi
D. Viruses
E. Viroids

43. For the symptomatic treatment of diarrhea, the doctor prescribed the patient a drug that inhibits intestinal peristalsis after making sure that the patient's diarrhea was of non-infectious origin. What drug was prescribed in this case?

A. Loperamide
B. Mannitol
C. Dexamethasone
D. Thiamine
E. Augmentin (Co-amoxiclav)

44. Cultivated annual plant with glands and indumentum has alternate obovate leaves and flat capitulum inflorescences with orange pseudoligulate ray florets and yellow tubular disc florets. Specify this plant.

A. *Calendula officinalis*
B. *Artemisia absinthium*
C. *Centaurea cyanus*
D. *Arctium lappa*
E. *Echinacea purpurea*

45. What type of indicators is used in the acid-base method of quantitative analysis?

A. pH indicators
B. Metallochromic indicators
C. Redox indicators
D. Adsorption indicators
E. Chemiluminescent indicators

46. The mechanism of action of hormones depends on their chemical nature. What hormones can penetrate the membrane and bind with intracellular receptors?

A. Steroid and thyroid hormones
B. Catecholamines
C. Tropic hormones
D. Insulin and glucagon
E. Oxytocin and vasopressin

47. What is the product of calcium carbide reaction with water: $CaC_2 + H_2O - >$?

A. $CH \equiv CH$
B. $CH_3 - CH_3$
C. $CH_2 = CH_2$
D. CH_4
E. $CH_3 - CH_2 - CH_3$

48. What can be used to distinguish formic acid from acetic acid?

A. $[Ag(NH_3)_2]OH$
B. $NaOH$
C. $Br_2(H_2O)$
D. H_2SO_4
E. $NaHCO_3$

49. In common corn (*Zea mays*), male spikelets are gathered in an apical panicle and female flowering spikelets form dense axillary spadices. What type of plant is *Zea mays*?

A. Monoecious
B. Dioecious
C. Polyecious
D. Monandrous
E. Unisexual

50. A patient, who has been suffering from chronic glomerulonephritis for the last 4 years, presents with a large amount of protein (4g/L) that appeared in the urinalysis. The levels of triglycerides and cholesterol increased in the patient's blood. What syndrome has complicated the course of the main disease in this case?

A. Nephrotic
B. Hypertensive
C. Inflammatory
D. Asthenic
E. Toxic