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

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. As a result of a stroke (hemorrhage in the brain), the patient cannot perform voluntary movements of the muscles in the head and neck. Brain examination using the NMR imaging revealed that the hematoma was located in the genu of the internal capsule. What conduction pathway is damaged in this patient?

A. *Fibrae corticonuclearis*
B. *Fibrae corticospinalis*
C. *Fibrae corticothalamicus*
D. *Fibrae frontopontinus*
E. *Fibrae thalamocorticalis*

12. During the lunch, a person ate salted herring and potatoes with pickles. After a while, this person became thirsty. This sensation has been caused by impulsation from certain receptors. Name these receptors.

A. Osmoreceptors in the hypothalamus
B. Volume receptors in the venae cavae and atria
C. Osmoreceptors in the liver
D. Volume receptors in the hypothalamus
E. Baroreceptors in the aortic arch

13. A patient presents with smoothed out right nasolabial fold and dilated right palpebral fissure (it cannot be closed during squinting, because the eyelids do not close). The patient has difficulty talking and eating (food becomes stuck between the cheek and

teeth). What nerve is damaged in this case?

A. *N. facialis dexter*
B. *N. abduceus dexter*
C. *N. glossopharyngeus sinister*
D. *N. vagus dexter*
E. *N. trigeminus dexter*

14. A 50-year-old man suddenly developed intense palpitations, pain in the heart, acute weakness, increased blood pressure, and an irregular pulse with pulse deficit. ECG shows f-waves instead of a P wave, R-R intervals are irregular. What heart rhythm disorder is observed in the patient?

A. Ciliary arrhythmia
B. Respiratory sinus arrhythmia
C. Paroxysmal tachycardia
D. Transverse heart block
E. Sinus extrasystole

15. Histology of the red bone marrow biopsy material detected cells of the granulocytic series. What changes occur in the nucleus during the differentiation of these cells?

A. Segmentation
B. Polyploidization
C. Pyknosis
D. Enucleation
E. Enlargement

16. The molecule of immature mRNA (pro-mRNA) contains more triplets than there are amino acids in the synthesized protein, because translation is normally preceded by:

A. Processing
B. Initiation
C. Repair
D. Mutation
E. Replication

17. In Tay-Sachs amaurotic idiocy that has an autosomal recessive pattern of inheritance, irreversible severe disorders of the central nervous system develop, leading to death in early childhood. In this disease, disturbed metabolism of certain substances is observed. Name these substances.

A. Lipids
B. Carbohydrates
C. Amino acids
D. Minerals
E. Nucleic acids

18. A patient has been hospitalized into the infectious diseases department with complaints of recurrent episodes of diarrhea and vomiting, pain in the leg muscles, weakness, and dizziness. After the examination, the doctor provisionally diagnosed the patient with cholera. What studies must be performed with the material obtained from the patient to make the express diagnosis?

A. Direct and indirect immunofluorescence
B. Agglutination reaction
C. Bacteriology
D. Serology
E. Biological method

19. During the examination of a child, the doctor noticed symmetrical roughness of the child's cheeks, diarrhea, and nervous disorders. What nutritional factors are deficient in this case, causing this condition in the child?

A. Nicotinic acid, tryptophan
B. Lysine, ascorbic acid
C. Threonine, pantothenic acid
D. Methionine, lipoic acid
E. Phenylalanine, pangamic acid

20. An 8-year-old child with an incised wound on the sole of the right foot has been brought to the hospital. Deep wound with dissection of the tendon of a muscle on the plantar surface, closer to the lateral edge of the foot, was detected during the surgical treatment. The patient presents with limited elevation of the lateral edge of the foot. What muscle is most likely functionally impaired in this case?

A. *M. peroneus longus*
B. *M. tibialis anterior*
C. *M. extensor digitorum longus*
D. *M. quadriceps femoris*
E. *M. triceps surae*

21. The plasma cell produces specific antibodies against a certain antigen. When the antigen is introduced into the body, the number of plasma cells increases. What blood cells increase in number in this case, resulting in increased total number of plasma cells?

A. B lymphocytes
B. T lymphocytes
C. Monocytes
D. Basophils
E. Eosinophils

22. A 30-year-old patient with a femoral fracture was brought to the hospital after a car accident. The patient presents with sharply reduced blood pressure of 70/40 mm Hg, a weak pulse, and increased pain response provoked by the slightest touch in the damaged area. What should be administered in this case to prevent traumatic shock in the patient?

A. Morphine
B. Paracetamol
C. Pentazocine
D. Analgin (Metamizole)
E. Papaverine

23. Autopsy of the body of a 40-year-old man, who died of odontogenic sepsis, revealed sharp thickening of poorly mobile semilunar aortic valves. The tissue of the valve is whitish and opaque. Its outer surface has thrombotic deposits 1x1.5 cm in size. What type of endocarditis is it?

A. Ulcerative polypoid endocarditis
B. Diffuse endocarditis
C. Acute verrucous endocarditis
D. Fibroplastic endocarditis
E. Recurrent verrucous endocarditis

24. A 28-year-old patient has been hospitalized with complaints of abdominal pain, loose stools, weakness, fatigue, and shortness of breath. The patient has a history of a surgery for acute intestinal obstruction 2 years ago, with resection of 60 cm of the small intestine. At the time of the hospitalization, patient's blood test results were as follows: erythrocytes — $2.4 \cdot 10^{12}$/L, reticulocytes — 0.4%, hemoglobin — 80 g/L, color index — 1.25. The blood smear test detected macroanisocytes, poikilocytes, schizocytes, isolated megalocytes, megaloblasts. What pathology of the blood system can be characterized by such findings?

A. B_{12} deficient anemia
B. Iron deficient anemia
C. Hypoplastic anemia
D. Hemolytic anemia
E. Chronic posthemorrhagic anemia

25. A histological specimen demonstrates a parenchymal organ, the structural and functional unit of which is a follicle. The wall of the follicle is formed by cuboidal cells. The cavity of the follicle is filled with a colloid. What organ is being demonstrated in the specimen?

A. Thyroid gland
B. Pituitary gland
C. Ovary
D. Salivary gland
E. Testicle

26. Autopsy of the body of a 44-year-old man, who died of cardiopulmonary failure, revealed pneumosclerosis, pulmonary emphysema, and hypertrophy of the right ventricle of the heart. Multiple mostly subpleural foci up to 1 cm in diameter are observed in both lungs. Histologically, in the center of the foci there is a zone of necrosis, while on their periphery a border consisting of epithelioid cells and lymphocytes with addition of macrophages and plasma cells is observed. Langhans giant cells are present. A small number of blood capillaries can be detected on the periphery of the lesion foci. What disease is it?

A. Hematogenous tuberculosis
B. Pulmonary actinomycosis
C. Sarcoidosis
D. Syphilis
E. Silicosis

27. Gastroscopy has detected a tumor-like formation 1.5 cm in diameter, attached to a pedicle, in the area of the lesser curvature. What is the character of the tumor growth in this case?

A. Exophytic
B. Expansive
C. Infiltrating
D. Appositional
E. Endophytic

28. A patient with acute appendicitis has been hospitalized into the surgical department. An appendectomy under local anesthesia was initially recommended to the patient. However, it was later discovered that the patient had a history of frequent allergic reactions to medicines. Select from the list the drug that would be the optimal chioce for infiltration anesthesia in this case.

A. Xycaine (Lidocaine)
B. Novocaine (Procaine)
C. Dicaine (Tetracaine)
D. Anesthesine (Benzocaine)
E. Cocaine

29. *Helicobacter pylori* was detected in a patient with peptic ulcer disease of the stomach. What drug should be used in this case?

A. Metronidazole
B. Biseptol (Co-trimoxazole)
C. Enteroseptol (Clioquinol)
D. Levomycetin (Chloramphenicol)
E. Sulfadimethoxine

30. A 6-year-old child has purulent inflammation of the middle ear that was complicated by purulent inflammation of the mastoid cells. Trepanation (dissection) of the mastoid process became necessary. In this case, the surgeon must remember that a certain venous sinus is located close by, to avoid damaging it. Name this sinus.

A. Sigmoid sinus
B. Superior sagittal sinus
C. Inferior sagittal sinus
D. Transverse sinus
E. Cavernous sinus

31. A 30-year-old man was hospitalized with profuse diarrhea lasting for 12 hours. There was no vomitting. What changes can be observed in the patient's water-electrolyte balance and acid-base balance?

A. Non-gaseous acidosis with dehydration
B. Gaseous acidosis with dehydration
C. Gaseous alkalosis with dehydration
D. No changes in blood pH
E. Non-gaseous alkalosis with dehydration

32. In a patient with diabetes mellitus, regeneration processes are reduced and wounds do not heal for a long time. What metabolic changes cause this condition in the patient?

A. Inhibition of protein synthesis
B. Accumulation of ketone bodies
C. Acidosis
D. Reduced glucose supply to the cells
E. Lipid metabolism disorder

33. A patient presents with a disturbed process of urea synthesis. It indicates the pathology of the following organ:

A. Liver
B. Kidneys
C. Brain
D. Muscles
E. Bladder

34. A patient has been diagnosed with myocardial infarction of the posterior wall of the left ventricle. In this case, thrombosis has occurred in the basin of the following artery:

A. *Ramus interventricularis posterior a.coronaria dextra*
B. *Ramus interventricularis anterior a.coronaria dextra*
C. *Ramus septalis posterior a.coronaria dextra*
D. *Ramus septalis anterior a.coronaria sinistra*
E. —

35. An adult man has 24-hour urine output of 20 liters with low specific gravity. This condition is most likely caused by the deficiency of a certain substance in the body. Name this substance.

A. Antidiuretic hormone
B. Aldosterone
C. Natriuretic factor
D. Renin
E. Parathyroid hormone

36. A 33-year-old woman has hepatocerebral dystrophy (Wilson's disease). Ceruloplasmin levels in her blood are decreased. Amino acid levels are sharply increased in her urine. These changes are primarily caused by the intensification of the following process:

A. Formation of copper complexes with amino acids
B. Urea synthesis
C. Reamination of amino acids
D. Breakdown of tissue proteins
E. Gluconeogenesis

37. Laboratory study of the blood of a 33-year-old patient revealed erythrocyte agglutination reaction in standard sera of groups I and II. Agglutination reaction was not observed with a group III serum and an anti-rhesus serum. What blood group (taking into account the CDE system) can be transfused to this person, if necessary?

A. III (B) Rh-
B. I (O) Rh+
C. II (A) Rh-
D. IV (AB) Rh+
E. IV (AB) Rh-

38. A 56-year-old man has type II diabetes mellitus and hypertension that are managed pharmaceutically. He constantly takes metformin, aspirin (acetylsalicylic acid), rosuvastatin, captopril, and furosemide. Laboratory tests show that his glycated hemoglobin (Hb A1c) is 8.0%, while fasting glucose is 12 mmol/L. The doctor decided to prescribe the patient glibenclamide. What is the mechanism of action of glibenclamide?

A. Stimulates insulin release
B. Stimulates glucose utilization within the cells
C. Facilitates glucose absorption within the intestine
D. Inhibits insulin release
E. —

39. The father and mother are healthy. Amniocentesis detects that the karyotype of the fetus is 45 X0. Make the diagnosis.

A. Turner syndrome
B. Edwards syndrome
C. Patau syndrome
D. Cri-du-chat syndrome
E. Trisomy X

40. Increased levels of angiotensin II have been detected in the blood of a patient with a hypertensive crisis. The pressor effect of angiotensin is associated with the:

A. Contraction of arteriolar muscles
B. Activation of biogenic amine synthesis
C. Hyperproduction of prostaglandins
D. Stimulation of vasopressin production
E. Activation of the kallikrein-kinin system

41. A large number of glucose oxidation metabolites are dissolved in the cytoplasm of myocytes. What metabolite can be directly converted into lactate?

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

42. A histological specimen of an eyeball shows a biconvex structure, connected to the ciliary body with the fibrous strands of the ciliary zonule and covered on top with a transparent capsule. What structure is it?

A. Crystalline lens
B. Vitreous body
C. Ciliary body
D. Cornea
E. Sclera

43. A 56-year-old woman complains of pain in the small joints of her hands and feet. She has been experiencing these symptoms for the last 12 years. Examination of her hands detects a subluxation of the metacarpophalangeal joints with fingers bent outwards ("walrus flippers"). There are high molecular weight immune complexes in the patient's blood. What disease corresponds with such pathological changes?

A. Rheumatoid arthritis
B. Rheumatic polyarthritis
C. Systemic lupus erythematosus
D. Dermatomyositis
E. Gouty arthritis

44. A 49-year-old woman developed leg edema after she had been standing for a long time. What is the likely cause of leg edema in this case?

A. Increased hydrostatic blood pressure in the veins
B. Decreased hydrostatic blood pressure in the veins
C. Decreased hydrostatic blood pressure in the arteries
D. Increased oncotic blood plasma pressure
E. Increased arterial blood pressure

45. During a blood transfusion, intravascular hemolysis of erythrocytes started developing in the patient. What type of hypersensitivity has developed in this patient?

A. Type II hypersensitivity (antibody-dependent)
B. Type I hypersensitivity (anaphylactic)
C. Type III hypersensitivity (immune complex)
D. Type IV hypersensitivity (cell-mediated cytotoxicity)
E. Type V hypersensitivity (granulomatosis)

46. A 48-year-old woman has been diagnosed with Raynaud syndrome and prescribed an adrenotropic agent. What group does this drug belong to?

A. α-blockers
B. β_1-blockers
C. β_1-adrenergic agonists
D. α/β-adrenergic agonists
E. β_2-blockers

47. During the surgery for a femoral hernia, the doctor operates within the borders of the femoral triangle. What structure forms its upper border?

A. *Lig. inguinale*
B. *Arcus iliopectineus*
C. *Lig. lacunare*
D. *Lig. pectinale*
E. *Fascia lata*

48. When stimulation frequency of an isolated heart of a rabbit increases, incomplete relaxation of the ventricles of the heart can be observed. Why does it happen?

A. Accumulation of calcium in cardiomyocytes
B. Increased sodium levels in cardiomyocytes
C. Inhibition of the sodium–potassium pump
D. Increased potassium levels in cardiomyocytes
E. Increased potassium levels in the interstitium

49. A patient has been diagnosed with a myocardial infarction. His blood was tested for the activity of cardiospecific enzymes. Which one of the detected

enzymes has three isoforms?

A. Creatine kinase
B. Lactate dehydrogenase
C. Aspartate transaminase
D. Alanine transaminase
E. Pyruvate kinase

50. Acute herpetic gingivostomatitis is the most common primary infection caused by herpes simplex virus, type 1. What material should a dentist obtain for laboratory testing to confirn this diagnosis?

A. Fluid from the vesicles
B. Blood
C. Saliva
D. Sputum
E. Urine