

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

The discovery of insulin

On 8 May 1980, the World Health Organization (WHO) declared smallpox to be eradicated - the first major disease, and the only human disease to date, to have been beaten. For centuries smallpox had been a major scourge, killing millions of people a year. As recently as the 1950s, more than 50 million people every year were infected by the disease. British physician Edward Jenner had discovered a vaccine in 1796, and smallpox deaths slowly reduced as vaccinations became widespread. As well as providing immunity to individuals, vaccines can protect the whole community. The more who are vaccinated and gain immunity, the fewer hosts the germ can find, and the less the disease can spread. However, intense opposition to mass vaccination programmes was sparked as vaccines accidentally became contaminated on occasion with other germs, such as syphilis. In the 1890s, British physician Sydney Copeman introduced the technique of storing vaccine in glycerine, dramatically improving its safety. Trust in vaccination lapsed, and by 1953 smallpox had been eliminated from the US and Europe. Extending vaccination programmes to tropical regions was difficult as the vaccine went off within a few days in warm conditions. Then two major innovations progressed the fight against smallpox. First, British scientist Leslie Collier found a way to freeze-dry the vaccine, enabling it to be stored as powder for up to six months, even in hot weather. Then the bifurcated (two-pronged) needle was invented by American microbiologist Benjamin Rubin, enabling the powdered vaccine to be simply pricked into the skin. In 1967, the WHO launched the Smallpox Eradication Programme in South America, Asia, and Africa. Key to the campaign's success was its "ring" strategy, which involved containing outbreaks within a set zone, or ring, of immunity to prevent further transmission. An infected person was isolated, and all potential contacts were immediately tracked, traced, and vaccinated. If that failed, everyone within a given radius would be given the vaccine. This avoided the need for mass vaccination programmes. In 1975, a three-year-old from Bangladesh became the last person to naturally contract the severe variant of smallpox; in 1977, the last case of the minor variant was identified in Somalia. In both cases the ring strategy was used, and the battle against smallpox was won. So far, only the animal disease rinderpest has also been eradicated, in 2011. The success with smallpox led the WHO's global immunization programme to target other vaccine-preventable diseases, such as measles, tetanus, diphtheria, and whooping cough. It is hoped that polio and Guinea worm disease may soon be eradicated.

1. When was smallpox declared eradicated by the World Health Organization (WHO)?

- A.** 1980
- B.** 1796
- C.** 1950s
- D.** 2011
- E.** —

2. What was the significance of Edward Jenner's discovery in 1796?

- A.** He discovered a vaccine against smallpox
- B.** He introduced the bifurcated needle
- C.** He eliminated smallpox in the US and Europe
- D.** He developed a method to freeze-dry the smallpox vaccine
- E.** —

3. What technique did Sydney Copeman introduce in the 1890s to improve the safety of the smallpox vaccine?

- A.** Storing the vaccine in glycerine
- B.** Using a two-pronged needle
- C.** Launching mass vaccination programs
- D.** Freezing the vaccine
- E.** —

4. Who invented the bifurcated (two-pronged) needle for administering the smallpox vaccine?

- A.** Benjamin Rubin
- B.** Edward Jenner
- C.** Leslie Collier
- D.** Sydney Copeman
- E.** —

5. What strategy was key to the success of the Smallpox Eradication Programme launched by the WHO in 1967?

- A.** The ring strategy
- B.** Mass vaccination programs
- C.** Isolation of infected individuals
- D.** Global immunization
- E.** —

6. What was the role of the "ring" strategy in the smallpox eradication campaign?

- A.** It prevented further transmission by containing outbreaks within a designated zone of immunity
- B.** It involved mass vaccination within a set zone of immunity
- C.** It focused on eradicating rinderpest in South America, Asia, and Africa
- D.** It targeted minor variants of smallpox
- E.** —

7. What was the last known case of the minor variant of smallpox identified, and where?

- A.** 1977 in Somalia
- B.** 1967 in South America
- C.** 1980 in the United States
- D.** 2011 in Bangladesh
- E.** —

8. Apart from smallpox, what is the only other disease that has been eradicated?

- A.** Rinderpest
- B.** Measles
- C.** Tetanus
- D.** Polio
- E.** —

9. What diseases does the text mentioned as potentially being eradicated in the future?

- A. Polio and Guinea worm disease
- B. Malaria and tuberculosis
- C. Rinderpest and smallpox
- D. Syphilis and Ebola
- E. —

10. The ring strategy in the Smallpox Eradication Programme involved mass vaccination within a designated zone.

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

11. What value determines the degree to which extraneous ions have an effect on the potential of the ion-selective electrode?

- A. Selectivity coefficient
- B. Diffusion coefficient
- C. Activity coefficient
- D. Electrical conductivity coefficient
- E. Osmotic coefficient

12. Bacteriology of patient's feces allowed isolating a pure culture of rod-shaped, slightly curved microorganisms that resembled schools of fish in the microslide. Their inoculation on alkaline media resulted in formation of a blue-tinted film after 6 hours. What pathogen has such properties?

- A. *Vibrio cholerae*
- B. *Escherichia coli*
- C. Salmonella
- D. Spirochete
- E. Mycobacterium

13. To determine the qualitative content of a drug, a sample of the analyte solution was processed with 2M solution of *HCl*. A white precipitate, soluble in aqueous ammonia solution, formed as a result. The presence of which cations does this analytical effect indicate?

- A. Silver(I) cations
- B. Lead(II) cations
- C. Mercury(I) cations
- D. Mercury(II) cations
- E. Tin(II) cations

14. What type of respiratory failure can be observed in a patient diagnosed with pneumonia?

- A. Restrictive
- B. Obstructive
- C. Central
- D. Peripheral
- E. Thoracodiaphragmatic

15. Sulfanilamides contain a primary aromatic amino group in their structure. What method is used for quantification of these compounds?

- A. Nitritometry
- B. Iodometry
- C. Dichromatometry
- D. Permanganatometry
- E. Cerimetry

16. What is the mechanism of inhibitory action of Neostigmine (Prozerin)?

- A.** Competition with acetylcholine for the active site of the enzyme
- B.** Denaturation of the enzyme
- C.** Covalent binding with the substrate of the enzyme
- D.** Covalent binding outside the active site of the enzyme
- E.** Oxidation of iron ions in the active site of the enzyme

17. The activity of a certain enzyme must be measured in the blood of a patient diagnosed with acute pancreatitis. What enzyme is it?

- A.** α -amylase
- B.** Alkaline phosphatase
- C.** Lactate dehydrogenase
- D.** Creatine kinase
- E.** Total bilirubin

18. What type of chromatography does the gas-liquid chromatography method belong to?

- A.** Distribution chromatography
- B.** Adsorption chromatography
- C.** Ion exchange chromatography
- D.** Gel chromatography
- E.** Affinity chromatography

19. Sedimentation is characteristic of which type of systems?

- A.** Suspensions
- B.** Solutions of high molecular substances
- C.** Sols
- D.** Electrolyte solutions
- E.** Non-electrolyte solutions

20. What is the main method of laboratory diagnostics of HIV infection?

- A.** Enzyme-linked immunosorbent assay
- B.** Radioimmunoassay
- C.** Passive hemagglutination assay
- D.** Coagglutination test
- E.** Immunofluorescence assay

21. What pathogen causes syphilis?

- A.** *Treponema pallidum*
- B.** *Borrelia recurrentis*
- C.** *Mycobacterium tuberculosis*
- D.** *Corynebacterium diphtheriae*
- E.** *Salmonella typhi*

22. What is the name of the reactions in which the cycle of elementary steps that involve active particles is repeated many times?

- A.** Chain reactions
- B.** Coupled reactions
- C.** Consecutive reactions
- D.** Parallel reactions
- E.** Photochemical reactions

23. What route of transmission is characteristic of epidemic typhus?

- A.** Vector-borne transmission
- B.** Vertical transmission
- C.** Fecal-oral transmission
- D.** Airborne-droplet transmission
- E.** Parenteral transmission

24. What method is used for quantification of bismuth in a preparation?

- A.** Complexonometry
- B.** Iodometry
- C.** Mercurimetry
- D.** Permanganatometry
- E.** Argentometry

25. What method of titration is used, when a precisely measured excess of the auxiliary titrant is added to the solution of the analyte substance?

- A.** Residual titration
- B.** Non-aqueous titration
- C.** Direct titration
- D.** Substitution titration
- E.** Any titration

26. Laboratories and factories use selective solvents to isolate and purify essential oils, alkaloids, antibiotics, and other medical substances. This method can also be used to isolate a pure substance from the reaction mixture or to continuously remove one of the reaction products from the reaction mixture in the process of synthesis. What is the name of the described method?

- A.** Extraction
- B.** Sedimentation
- C.** Coagulation
- D.** Flocculation
- E.** Flotation

27. Aminoglycoside antibacterial drugs prevent the attachment of formylmethionyl-tRNA by binding themselves to the 30S subunit of ribosomes. What process becomes disrupted as a result?

- A.** Translation initiation
- B.** Translation termination
- C.** Transcription initiation
- D.** Transcription termination
- E.** Replication initiation

28. What medicinal plant belongs to the group of weeds?

- A.** *Plantago major*
- B.** *Papaver somniferum*
- C.** *Mentha piperita*
- D.** *Convallaria majalis*
- E.** *Salvia officinalis*

29. What non-steroidal anti-inflammatory drug should be prescribed to a patient diagnosed with rheumatoid arthritis and concomitant peptic ulcer disease of the duodenum?

- A.** Celecoxib
- B.** Acetylsalicylic acid
- C.** Paracetamol
- D.** Analgin (Metamizole)
- E.** Diclofenac sodium

30. What psychotropic drug blocks dopamine receptors?

- A.** Aminazine (Chlorpromazine)
- B.** Analgin (Metamizole sodium)
- C.** Diazepam
- D.** Caffeine and sodium benzoate
- E.** Amitriptyline

31. Which one of the listed drugs is an H₂ histamine blocker?

- A.** Famotidine
- B.** Gastrozepin (Pirenzepine)
- C.** Omeprazole
- D.** Almagel
- E.** Allocholum

32. What family of plants can be characterized by pseudomonocarpous nut-like fruits and membranous stipules that fuse into an ochrea?

- A.** *Polygonaceae*
- B.** *Brassicaceae*
- C.** *Lamiaceae*
- D.** *Fabaceae*
- E.** *Rosaceae*

33. What is the pathogenesis of

type 1 diabetes mellitus?

- A.** Autoimmune damage to B cells
- B.** Adipose tissue insulin resistance
- C.** Hyperproduction of glucagon
- D.** Hyperproduction of cortisol
- E.** Hyperproduction of somatotropin

34. What class of compounds does Cytochrome P450 belong to?

- A.** Hemoprotein
- B.** Flavoprotein
- C.** Pyridinoprotein
- D.** Lipoprotein
- E.** Nucleoprotein

35. On which parameter does coagulation capability of an electrolyte depend?

- A.** Charge of the coagulating ion
- B.** Electrolyte concentration
- C.** Degree of sol dispersion
- D.** Sol volume
- E.** Sol density

36. What is the most common side effect of inhaled corticosteroids?

- A.** Oropharyngeal candidiasis
- B.** Increased body mass
- C.** Osteoporosis
- D.** Subcapsular cataract
- E.** Arterial hypertension

37. What pigment forms in the process of the heme oxidation reaction?

- A.** Biliverdin
- B.** Chlorophyll
- C.** Stercobilinogen
- D.** Urobilinogen
- E.** Carotene

38. Microscopy shows that basidia with basidiospores are formed on the hymenium. What division do these fungi belong to?

- A.** *Basidiomycota*
- B.** *Ascomycota*
- C.** *Zygomycota*
- D.** *Chytridiomycota*
- E.** *Lychnophyta*

39. What pathogenetic factor plays the leading role in the development of edema in patients after prolonged fasting?

- A.** Decreased oncotic blood pressure
- B.** Decreased hydrostatic blood pressure
- C.** Decreased osmotic blood pressure
- D.** Increased oncotic pressure in the tissues
- E.** Increased osmotic pressure of the interstitial liquid

40. Select an anticholinesterase drug from the list.

- A.** Proserin (Neostigmine)
- B.** Acetylcholine
- C.** Dithylin (Suxamethonium chloride)
- D.** Isonitrosine
- E.** Dipyroxime (Trimedoxime bromide)

41. A woman in the state of ketoacidotic coma has loud rapid respiration: a labored expiration with active participation of expiratory muscles occurs after a deep inspiration. What type of respiration is it?

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

42. What component of a bacterial cell provides the bacterium with adaptive capabilities and ensures its protection against adverse environmental conditions?

- A. Spores
- B. Flagella
- C. Capsule
- D. Cilia
- E. Inclusions

43. How are salts and esters of oxalic acid called?

- A. Oxalates
- B. Adipinates
- C. Succinates
- D. Malonates
- E. Urates

44. What is the mechanism of Br_2 attaching to propene?

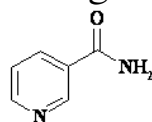
- A. A_E
- B. S_E
- C. S_R
- D. A_N
- E. S_N

45. Primary and secondary nitroalkanes are tautomeric compounds. What tautomerism is characteristic of them?

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

46. Nicotinamide (vitamin PP) is a derivative of a certain

nitrogen-containing heterocycle.



Name this heterocycle.

- A. Pyridine
- B. Quinoline
- C. Pyrrole
- D. Indole
- E. Pyrrolidine

47. What solution 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. $NaHCO_3$

48. What antihypertensive drug can be prescribed for patients with bronchial asthma?

- A. Metoprolol
- B. Anaprilin (Propranolol)
- C. Labetalol
- D. Farmadipine (Nifedipine)
- E. Nadolol

49. A man diagnosed with diabetes mellitus has the following arterial blood values: blood pH — 7.25, pCO_2 — 37 mm Hg, standard bicarbonate (SB) — 19.5 mmol/L, buffer base (BB) — 39 mmol/L, base excess (BE) — (-7) mmol/L, blood ketone bodies — 1.9 mmol/L, titratable acidity of urine — 50 mmol per 24 hours. What acid-base imbalance is observed in this patient?

- A.** Metabolic acidosis
- B.** Gaseous alkalosis
- C.** Gaseous acidosis
- D.** Mixed alkalosis
- E.** Mixed acidosis

50. What structures of plant cells

accumulate secondary starch?

- A.** Amyloplasts
- B.** Elaioplasts
- C.** Proteoplasts
- D.** Vacuoles
- E.** Mitochondria