

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

### Plague

Naturally acquired plague most commonly manifests in the bubonic form, with acute onset of fever and painful swollen regional lymph nodes (buboes). Less commonly, plague manifests in the septicemic form or as pneumonic plague, and, rarely, as meningeal, pharyngeal, ocular, or gastrointestinal plague. Abrupt onset of fever, chills, headache, and malaise are characteristic in all cases. Occasionally, patients have symptoms of mild lymphadenitis or prominent gastrointestinal tract symptoms, which may obscure the correct diagnosis.

When left untreated, plague will often progress to overwhelming sepsis with renal failure, acute respiratory distress syndrome, instability, diffuse intravascular coagulation, necrosis of distal extremities, and death.

Plague is caused by *Yersinia pestis*, a pleomorphic, bipolar-staining, gram-negative coccobacillus.

Plague is a zoonotic infection primarily maintained in rodents and their fleas. Humans are incidental hosts who typically develop bubonic or primary septicemic manifestations through the bite of infected rodent fleas or direct contact with tissues of infected animals. Secondary pneumonic plague arises from hematogenous seeding of the lungs with *Y. pestis* in patients with untreated bubonic or septicemic plague. Primary pneumonic plague is acquired by inhalation of respiratory tract droplets from a human or animal with pneumonic plague. Only the pneumonic form has been shown to be transmitted from person to person, and the last known case of person-to-person transmission in the United States occurred in 1924. Rarely, humans can develop primary pneumonic plague following exposure to domestic cats with respiratory tract plague infections. Plague occurs worldwide with enzootic foci in parts of Asia, Africa, and the Americas. Most human plague cases are reported from rural, underdeveloped areas and mainly occur as isolated cases or in small, focal clusters. Since 2000, more than 95% of the approximately 22,000 cases reported to the World Health Organization have been from countries in sub-Saharan Africa.

1. Bubonic plague is the most common form of plague.

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

2. The rarest form of plague is meningeal.

A. Not given

B. False

C. True

D. -

E. -

3. A plague is a severe illness and can often lead to death.

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

4. Most cases of plague are happening in big city centres.

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

5. What are buboes?

- A.** The lymph nodes that are swollen
- B.** The pathognomonic rash
- C.** The pathognomonic type of fever
- D.** The type of cells that are found in the blood
- E.** -

6. Choose the correct statement.

- A.** Animals are main hosts of *Yersinia pestis*
- B.** Only animals can have a plague
- C.** Animals are incidental hosts of *Yersinia pestis*
- D.** Both animals and humans can be the main hosts of *Yersinia pestis*
- E.** -

7. Can the plague be transmitted from person to person?

- A.** Yes, but it's rare
- B.** Yes, it's main way to its spreading
- C.** No, it can never be the case
- D.** It is still unknown
- E.** -

8. Choose the correct statement.

- A.** Plague occurs all over the world
- B.** Plague can occur only in African countries
- C.** Plague most often occurs in the USA
- D.** Plague occurs only in Asia and Africa
- E.** -

9. How does secondary pneumonic plague occur?

- A.** Due to hematogenous seeding of the lungs with *Y. pestis* in patients with untreated other forms of plague
- B.** Due to untreated primary pneumonic plague
- C.** Due to hematogenous seeding of the lungs with *Y. pestis* in patients with respiratory diseases
- D.** Due to inhalation of respiratory tract droplets from a human or animal with pneumonic plague
- E.** -

10. What is the most common way of plague transmission?

- A.** Through the bite of infected rodent fleas or direct contact with tissues of infected animals
- B.** Person-to-person transmission
- C.** Haematogenic transmission
- D.** Inhalation of respiratory tract droplets from an animal with plague
- E.** -

11. In redox titrimetry, the indicators that are added to the reaction system respond to the changes in the:

- A.** Redox potential of the system
- B.** Concentration of hydroxyl ions
- C.** Ionic strength of the solution
- D.** Degree of ionization of the substance being analyzed
- E.** Concentration of hydrogen ions

**12.** For tetanus prevention, a toxin that has been neutralized with formalin (0.4%) at the temperature of  $39^{\circ}\text{C}$  for four weeks is used. What kind of preparation is it?

- A.** Anatoxin
- B.** Immunoglobulin
- C.** Antitoxic serum
- D.** Adjuvant
- E.** Inactivated vaccine

**13.** What indicator is used, when sodium carbonate is being quantified in the preparation by means of acid-base titration?

- A.** Methyl orange
- B.** Murexide
- C.** Methylene blue
- D.** Diphenylamine
- E.** Ferroin

**14.** The main mechanism of ammonia neutralization in the body is the biosynthesis of urea. The cycle of urea synthesis begins with the formation of a certain high-energy compound. What high-energy compound is it?

- A.** Carbamoyl phosphate
- B.** Citrulline
- C.** Arginine
- D.** Fumaric acid
- E.** Argininosuccinate

**15.** Coumarins, vitamin *K* antagonists, suppress the processes of blood coagulation. Synthesis of what protein is blocked by coumarins?

- A.** Prothrombin
- B.** Gamma globulin
- C.** Albumin
- D.** Transferrin
- E.** Ceruloplasmin

**16.** People, who were indoors during a fire, suffer from a carbon monoxide poisoning. What type of hypoxia is observed in such cases?

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

**17.** Vitamins can enhance each other's effects, when taken simultaneously. What vitamin potentiates the activity of vitamin *P*?

- A.** C
- B.** D
- C.** B<sub>1</sub>
- D.** B<sub>2</sub>
- E.** A

**18.** A man has undergone a course of radiotherapy and chemotherapy. The drug complex included 5-fluorodeoxyuridine that is an inhibitor of thymidylate synthase. This drug blocks the synthesis of a certain substance. What substance is it?

- A.** DNA
- B.** mRNA
- C.** rRNA
- D.** tRNA
- E.** Protein

**19.** To preserve valuable varietal qualities of peppermint, the optimal method of its propagation was chosen. What method is it?

- A.** Parts of the rhizome
- B.** Parts of the tuber
- C.** Leaf cuttings
- D.** Germinated seeds
- E.** Plantlets

**20.** The presence of antibodies to HIV has been established in the analyzed serum by means of enzyme-linked immunosorbent assay. What method or reaction must be used to confirm the diagnosis of AIDS?

- A.** Immunoblotting
- B.** Biological method
- C.** Bacteriological method
- D.** Virological method
- E.** Immunofluorescence

**21.** During the assessment of air purity in an aseptic unit of a pharmacy, sedimentation analysis resulted in growth of small colonies with areas of hemolysis. What medium was used for inoculation in this case?

- A.** Blood agar
- B.** Levine formulation (eosin methylene blue agar)
- C.** Endo agar
- D.** Ploskirev agar
- E.** Egg-yolk salt agar

**22.** How many stereoisomeric aldohexoses exist?

- A.** 16
- B.** 8
- C.** 2
- D.** 4
- E.** 6

**23.** To what electrode will a 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.** Will not move anywhere

**24.** What physico-chemical method is used to determine the pH of solutions for injections?

- A.** Potentiometry
- B.** Conductometry
- C.** Amperometry
- D.** Polarography
- E.** Electrolysis

**25.** What solution is used to determine the mass-volume fraction of ammonia in a solution?

- A.** Hydrochloric acid solution
- B.** Sulfuric acid solution
- C.** Potassium permanganate solution
- D.** Iodine solution
- E.** Sodium hydroxide solution

**26.** What reference electrode can be used in the potentiometric analysis of a medicinal substance?

- A.** Silver chloride electrode
- B.** Glass electrode
- C.** Quinhydrone electrode
- D.** Antimony electrode
- E.** Zinc electrode

**27.** What substances can be determined by means of substitution titration using the iodometric method?

- A.** Strong oxidizing agents
- B.** Strong reducing agents
- C.** Weak reducing agents
- D.** Saturated hydrocarbons
- E.** Unsaturated hydrocarbons

**28.** In the roots of primary structure, the nutrient reserves are stored in the:

- A.** Mesodermis
- B.** Exodermis
- C.** Pericycle
- D.** Endodermis
- E.** Central axial cylinder

**29.** Proteins are the catalysts of biochemical processes. What type of homogeneous catalysis includes the processes with their participation?

- A.** Enzyme catalysis
- B.** Acid-base catalysis
- C.** Redox catalysis
- D.** Coordination catalysis
- E.** Gas-phase homogeneous catalysis

**30.** After eating strawberries, a child developed itchy red spots on the skin (urticaria). What type of leukocytosis would be detected in this child?

- A.** Eosinophilic
- B.** Basophilic
- C.** Neutrophilic
- D.** Lymphocytic
- E.** Monocytic

**31.** In the process of asexual reproduction, higher spore-forming plants have the ability to form spores, which is an adaptation to life on dry land. What set of chromosomes do their spores have?

- A.** Haploid
- B.** Diploid
- C.** Triploid
- D.** Tetraploid
- E.** Polyploid

**32.** A man has a nitrate poisoning. What type of hypoxia will

develop in this case?

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

**33.** X-ray of a 59-year-old patient shows a distinct shadow, differential for tumor, in the lower lobe of the right lung. Provisionally, the tumor has been identified as benign. What characteristic allows classifying the tumor as benign?

- A.** Expansive growth
- B.** Metastasis
- C.** Cancer cachexia
- D.** Invasion into the surrounding tissues
- E.** Infiltrating growth

**34.** There are certain patterns of chemical and biological processes occurring with the drug in the body. Reduced absorption of tetracycline when it is co-administered with antacids is an example of:

- A.** Pharmacokinetic incompatibility
- B.** Pharmaceutical incompatibility
- C.** Pharmacodynamic incompatibility
- D.** Synergism
- E.** Functional antagonism

**35.** What drug is a non-selective beta-blocker?

- A.** Anaprilin (Propranolol)
- B.** Metoprolol
- C.** Adrenaline hydrochloride
- D.** Prozerin (Neostigmine)
- E.** Atropine

**36.** What drug should be prescribed to a patient with

bronchospasm?

- A. Salbutamol
- B. Oxytocin
- C. Insulin
- D. Vicasol (Menadione)
- E. Bisacodyl

**37.** A student studies the digestive system of vertebrates. The organ that is being studied is primarily located in the right upper quadrant of the abdomen. It detoxifies various metabolites, produces hormones and digestive biochemicals, regulates glycogen storage, synthesizes proteins, and decomposes red blood cells. What organ is being studied by the student?

- A. Liver
- B. Heart
- C. Kidneys
- D. Pancreas
- E. Lungs

**38.** A patient complains of loss of appetite, weight loss, weakness, and abdominal pain. Laboratory blood test shows the following: Hb — 90 g/L; erythrocytes —  $2.0 \cdot 10^{12}/L$ ; color index — 1.4.  $B_{12}$  deficiency anemia has been diagnosed. What substance is deficient in this patient, causing the anemia?

- A. Castle factor
- B. Pepsin
- C. Renin
- D. Secretin
- E. Hydrochloric acid

**39.** A patient with an acute myocardial infarction had been receiving heparin as a component of complex therapy. After a time, the patient developed hematuria. What drug is indicated as an

antidote to heparin?

- A. Protamine sulfate
- B. Aminocaproic acid
- C. Vicasol (Menadione)
- D. Fibrinogen
- E. Neodicoumarin (ethyl biscoumacetate)

**40.** In the process of creating vaccines, pathogens of infectious diseases are being attenuated. What is the essence of the attenuation process?

- A. Artificial reduction of virulent properties of pathogens
- B. Inactivation of pathogens while preserving the antigenic structure of cells
- C. Isolation of protective antigens from microbial cells
- D. Reduction of immunogenicity of the pathogen
- E. Discovering antigenic determinants of the main antigens of the pathogen

**41.** A benzimidazole derivative, omeprazole, has been prescribed to a patient with a duodenal ulcer accompanied by an increased secretion of gastric juice. What is the mechanism of action of this drug?

- A. Irreversible blockade of  $H^+$ ,  $K^+$  -ATPase
- B. Blockade of  $H_2$ -histamine receptors
- C. Blockade of  $M_1$ -cholinergic receptors
- D. Stimulation of  $H^+$ ,  $K^+$  -ATPase
- E. Stimulation of  $H_2$ -histamine receptors

**42.** A patient with gout has been prescribed allopurinol. What is the mechanism of action of this

drug?

- A. Inhibition of xanthine oxidase enzyme, inhibition of uric acid synthesis
- B. Stimulation of uric acid breakdown
- C. Intensification of uric acid excretion by the kidneys
- D. Inhibition of COX-2 enzyme
- E. Activation of microsomal oxidation in the liver

43. The fruit is a bright-red juicy follicetum with a sweet-sour taste. Its seeds are kidney-shaped and smell similar to lemon. Such fruits belong to:

- A. *Schisandra chinensis*
- B. *Citrus limon*
- C. *Malus domestica*
- D. *Viburnum opulus*
- E. *Sorbus aucuparia*

44. The type of bacterial respiration is of great importance for the growth and reproduction of bacteria. Some species are unable to reproduce in the presence of oxygen and use sulfate respiration. What are these microorganisms called?

- A. Obligate anaerobes
- B. Facultative anaerobes
- C. Obligate aerobes
- D. Microaerophiles
- E. Macroaerophiles

45. Helmholtz energy is the direction criterion of an arbitrary process at a constant:

- A. Temperature and volume
- B. Temperature and pressure
- C. Entropy and volume
- D. Internal energy and volume
- E. Entropy and pressure

46. What reagent can be used to

distinguish maltose (a reducing disaccharide) from sucrose (a non-reducing disaccharide)?

- A. Tollens reagent
- B.  $NaOH$
- C.  $FeCl_3$
- D.  $Br_2$
- E.  $K_4[Fe(CN_6)]$

47. What reaction occurs according to the free-radical (SR) mechanism?

- A.  $C_2H_6 + Cl_2$
- B.  $C_6H_6 + Cl_2$
- C.  $CH_2 = CH_2 + Cl_2$
- D.  $CH_3CH_2OH + HCl$
- E.  $CH_3-CH_3 + O_2$

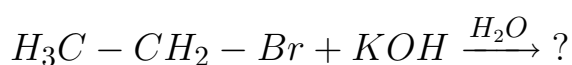
48. In what pair of substances the both of them form a precipitate of metallic silver when Tollens reagent is added (during heating)?

- A. Propanal and formic acid
- B. Acetic acid and formic acid
- C. Ethanol and formic acid
- D. Propanal and acetic acid
- E. Propanol and formic acid

49. In medicine and pharmacy, such phenomena as adsorption, wetting, adhesion, etc. can be observed. What are they called?

- A. Superficial phenomena
- B. Electrokinetic phenomena
- C. Molecular-kinetic phenomena
- D. Optical phenomena
- E. Physico-chemical phenomena

50. What is the final product, obtained as a result of heating bromoethane with an aqueous solution of potassium hydroxide?



- A.** Ethanol
- B.** Ethane
- C.** Ethene
- D.** Ethanoic acid
- E.** Diethyl ether