AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI

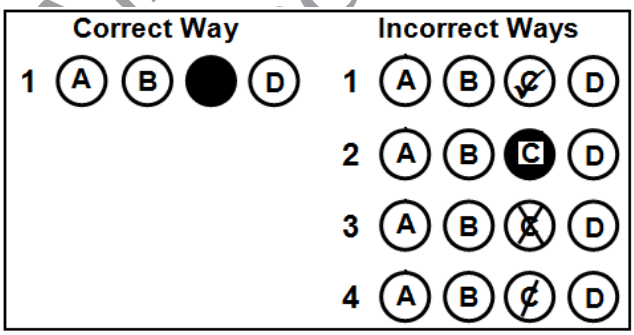
ANNUAL EXAMINATIONS (THEORY) 2023

Biology Paper I

Time: 1 hour 30 minutes Marks: 50

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 50 only.
4. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.



Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. You may use a scientific calculator if you wish.

1. A group of zoologists discovered the presence of a new species of octopus in the Pacific Ocean.

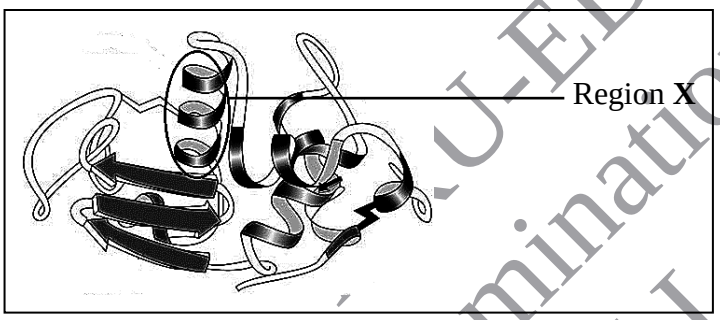
   This case is related to the study of

   A. fresh water biology.
   B. molecular biology.
   C. marine biology.
   D. parasitology.

2. The method of treatment of disease in which bone marrow cells are used is

   A. gene therapy.
   B. radiotherapy.
   C. chemotherapy.
   D. physiotherapy.

3. The given diagram shows the structure of a protein.



   In the labelled region **X**, the type of secondary structure and the type of bond that stabilises the secondary structure is

	Type of Secondary Structure	**Type of Bond**
A	β-sheet	hydrogen
B	α-helix	hydrogen
C	β-sheet	ionic
D	α-helix	ionic

4. The polysaccharide that contains nitrogen is

   A. chitin.
   B. starch.
   C. cellulose.
   D. glycogen.

5. A polypeptide chain contains 120 amino acids.

   The number of DNA nucleotides that would be required to code for this polypeptide chain are

   A. 40
   B. 120
   C. 360
   D. 480

6. The biological process which uses the property of latent heat of vapourisation of water is

   A. transpiration.
   B. translocation.
   C. excretion.
   D. egestion.

7. Carbon is involved in the synthesis of various complicated cellular structures because of its ability to make

   A. two ionic bonds.
   B. four ionic bonds.
   C. four covalent bonds.
   D. two hydrogen bonds.

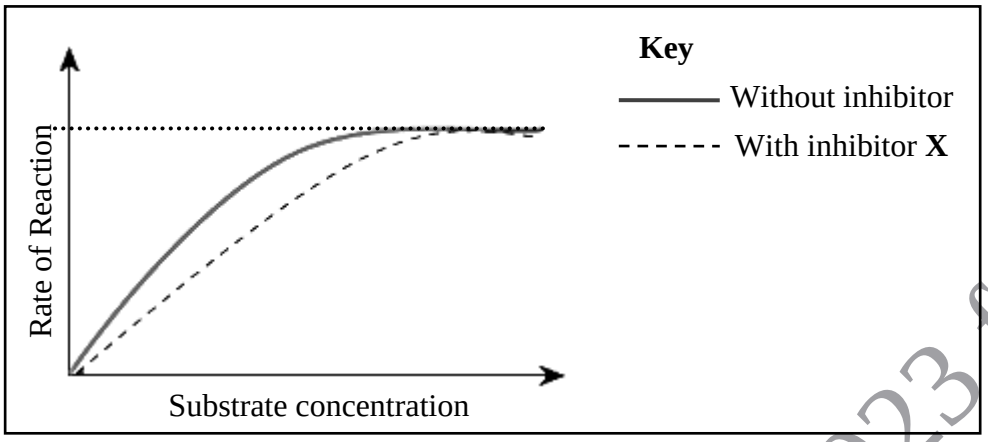
8. The given table shows the percentage of product formation in an enzyme-catalysed reaction at different temperatures.

S. No.	Temperature (°C)	Percentage (%) of Product Formation
I	20	40
II	25	60
III	30	80
IV	35	100

   The optimum temperature for the enzyme to form the product would be

   A. I.
   B. II.
   C. III.
   D. IV.

9. The given graph shows the effect of substrate concentration, with and without inhibitor, on the rate of enzyme-catalysed reaction.

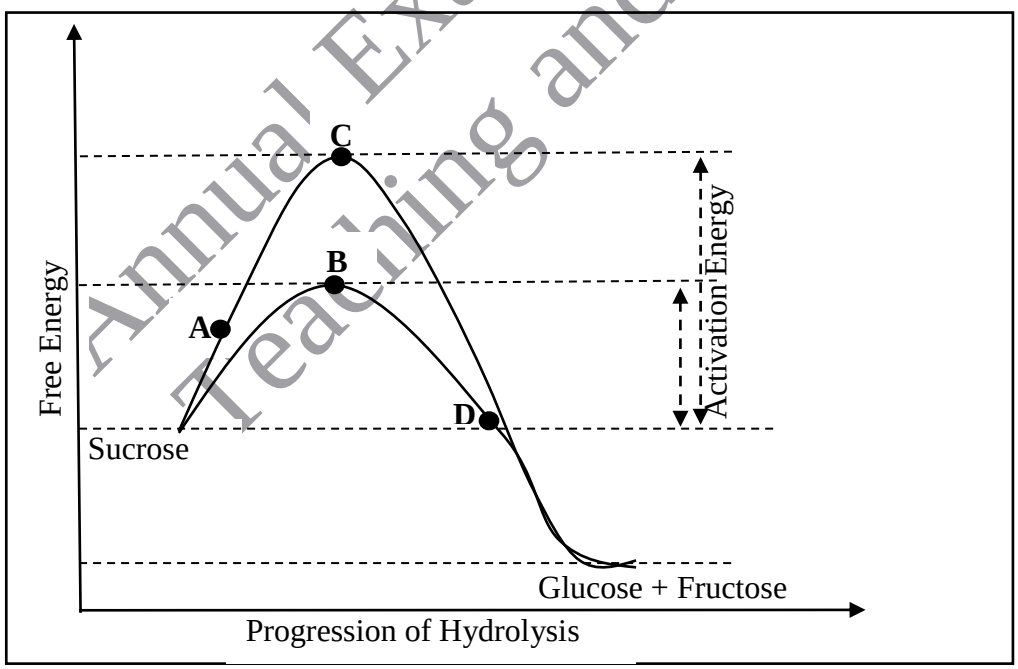


The inhibitor **X** is identified as

A. reversible and competitive inhibitor.
B. irreversible and competitive inhibitor.
C. reversible and non-competitive inhibitor.
D. irreversible and non-competitive inhibitor.

10. The given graph shows the comparison of activation energy in hydrolysis of sucrose with and without an enzyme.

The labelled point on the graph which indicates the unstable condition of sucrose molecule in the enzyme-catalysed hydrolysis is



11. RNA polymerase synthesises new bonds between RNA nucleotides during transcription.

    Based on the given function, the class of enzymes to which RNA polymerase belongs is

    A. lyases.
    B. ligases.
    C. hydrolases.
    D. isomerases.

12. Cisternae of Golgi apparatus are formed by the fusion of vesicles. These vesicles are bud-off from the

    A. ribosomes.
    B. plasma membrane.
    C. nuclear membrane.
    D. endoplasmic reticulum.

13. A researcher wants to know the effect of magnesium ions on the function of cell organelles. He/ She grows some eukaryotic cells in a medium which lacks magnesium ions.

    Which of the following functions will be interrupted in these cells?

    A. Assembling of ribosomal subunits during protein synthesis
    B. Secretion of hydrolytic enzymes by lysosomes
    C. Production of ATP by mitochondria
    D. Coiling of DNA during cell division

14. Which of the following functions are performed by peroxisomes in eukaryotic cells?

    A. They store nucleic acids.
    B. They oxidise hydrogen peroxide.
    C. They convert fat into carbohydrates.
    D. They facilitate the process of cell division.

15. In a eukaryotic cell, all of the following are the functions of centrioles EXCEPT that they

    A. help in cell division of animal cells.
    B. serve as the site of connection between sister chromatids.
    C. help to determine the location of the nucleus within the cell.
    D. organise microtubules that serve as the cell's skeletal system.

16. In contrast to triploblastic animals, diploblastic animals have

    A. coelom lined by mesoderm.
    B. mouth and anus as two body openings.
    C. a mesodermal layer that forms muscles.
    D. a gastrovascular cavity with one opening only.

17. The feature of bristle worms (Polychaetes) that makes them different from other classes of phylum annelida is that bristle worms

A. lack parapodia and setae.
B. lack parapodia and have few setae per segment.
C. bear a pair of parapodia with many setae in each segment.
D. bear two pairs of parapodia with few setae in each segment.

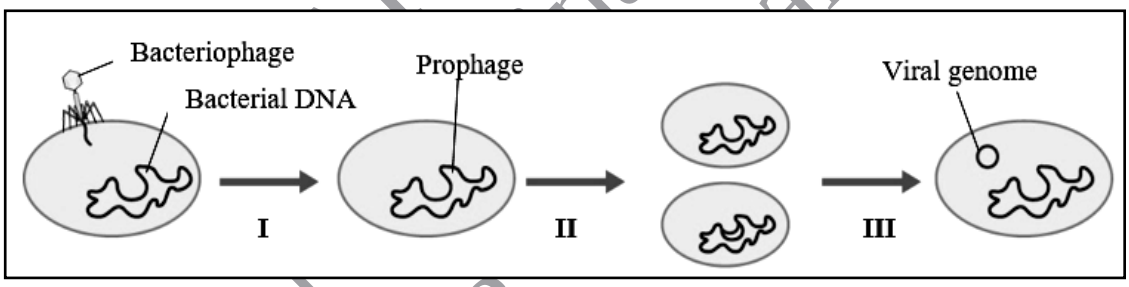
18. The body cells of sponges that secrete materials for the formation of skeletal spicules are

A. porocytes.
B. pinacocytes.
C. choanocytes.
D. amoebocytes.

19. In earthworm excretion takes place through

A. kidneys.
B. protonephridia.
C. metanephridia.
D. protostomium.

20. The given diagram shows different stages of lysogenic cycle of a temperate bacteriophage.



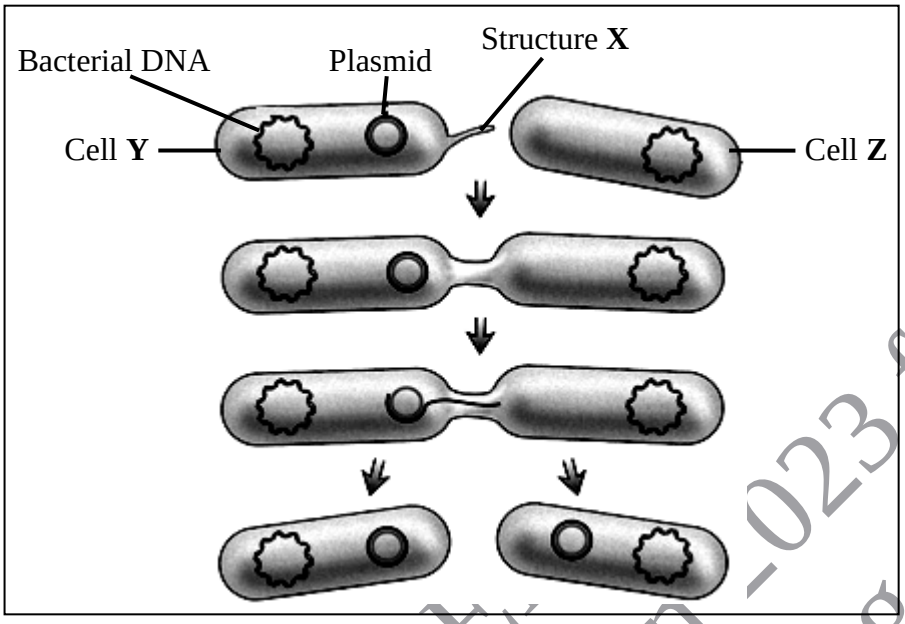
The stage(s) where induction has occurred is/ are

A. I only.
B. III only.
C. I and II.
D. II and III.

21. In humans, Creutzfeldt-Jakob disease (CJD) is caused by

A. prion.
B. viroid.
C. retrovirus.
D. bacteriophage.

22. The given diagram shows the process of conjugation in bacteria.



The option that CORRECTLY identifies the labelled structure **X**, cells **Y** and **Z** is

	X	**Y**	**Z**
A	pilus	F^+	F^+
B	pilus	F^+	F^-
C	flagellum	F^-	F^-
D	flagellum	F^+	F^-

23. Which of the following features is related to thermophilic bacteria?

A. Bacteria that live in extreme temperature of hot streams
B. Cyanobacteria play an important role in nitrogen fixation
C. Bacterial species *Salmonella typhi* cause typhoid in humans
D. Bacteria in the large intestine of humans synthesise vitamins

24. Based on the modes of nutrition, bacteria that serve the role of decomposers in the environment are categorised as

A. photoautotrophs.
B. chemoautotrophs.
C. photoheterotrophs.
D. chemoheterotrophs.

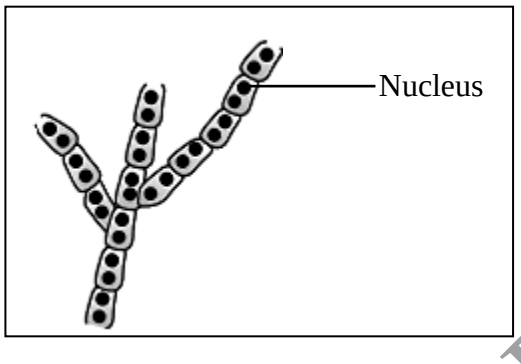
25. Seaweeds is the common name used for

A. diatoms.
B. green algae.
C. brown algae.
D. dinoflagellates.

26. Protists that form a monophyletic lineage with plants are

A. fucus and ulva.
B. ulva and spirogyra.
C. polysiphonia and fucus.
D. polysiphonia and spirogyra.

27. The given diagram shows the secondary mycelium of a basidiomycete.



In the life cycle of basidiomycete, this mycelium is formed when

A. meiosis occurs in the gills of basidiocarp.
B. germination of basidiospores takes place in the basidiocarp.
C. plasmogamy occurs between positive and negative mating types.
D. karyogamy in the basidia leads to the formation of diploid nuclei.

28. The oyster mushroom penetrates the nematodes, absorbs their nutrients and result in death of nematodes.

This type of feeding relationship in fungi is an example of

A. mutualism.
B. predation.
C. commensalism.
D. decomposition.

29. Green algae and fungal species of ascomycetes forms a mutualistic association with each other.

This type of association is identified as

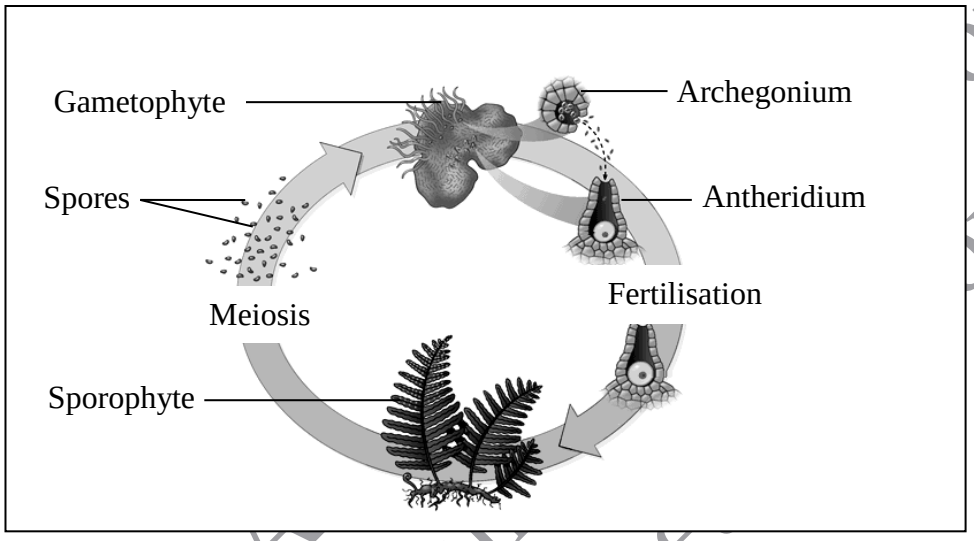
I. lichen
II. ectomycorrhizal
III. endomycorrhiza

A. I only.
B. II only.
C. III only.
D. II and III.

30. One of the changes that would occur in an ovary of flowering plants after double fertilisation is that the

A. pollen tube will disappear.
B. antipodal cells will double in number.
C. polar nuclei will form triploid endosperm.
D. egg cell will fuse with synergids to form diploid zygote.

31. The given diagram shows the life cycle of a plant.



The feature in the given life cycle due to which this plant is classified as a tracheophyte is the presence of

A. haploid spores.
B. dominant sporophyte.
C. independent gametophyte.
D. antheridium and archegonium.

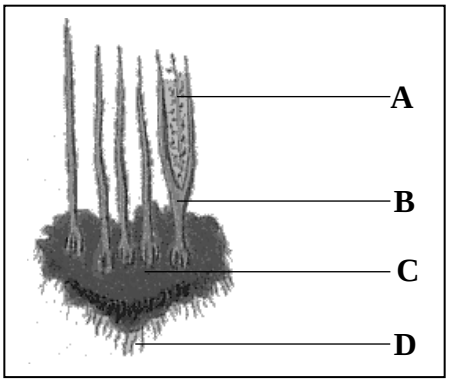
32. In liverworts, asexual reproduction takes place by

A. fragmentation of thalli and gemmae cups.
B. fragmentation of thalli and oospores.
C. gemmae cups and zoospores.
D. oospores and zoospores.

33. In club mosses (lycopsida), microphylls are evolved from

A. a short stem bearing side branches.
B. small projecting extensions of stem tissue.
C. side branches dividing in same spatial plane.
D. infilling of simple tissues between lateral branches.

34. In the given diagram of hornwort, antheridia and archegonia are found embedded in the labelled part



35. In the chloroplast of plant cells, large number of antennae pigment molecules in the photosystem embedded in the thylakoid membrane, allows the

A. reaction centre to gain the greatest possible amount of energy.
B. light energy to be harvested in the molecule of electron acceptor.
C. accessory pigment molecules to get closely associated with each other.
D. chlorophyll-b molecule in the reaction centre to become highly energised.

36. In the light-dependent reactions of photosynthesis, non-cyclic and cyclic flow of electrons takes place.

The cyclic flow of electrons is named so because after the production of

A. ATP molecules, the electrons are cycled back into the photosystem I.
B. ATP molecules, the electrons are cycled back into the photosystem II.
C. NADPH molecules, the electrons are cycled back into the photosystem I.
D. NADPH molecules, the electrons are cycled back into the photosystem II.

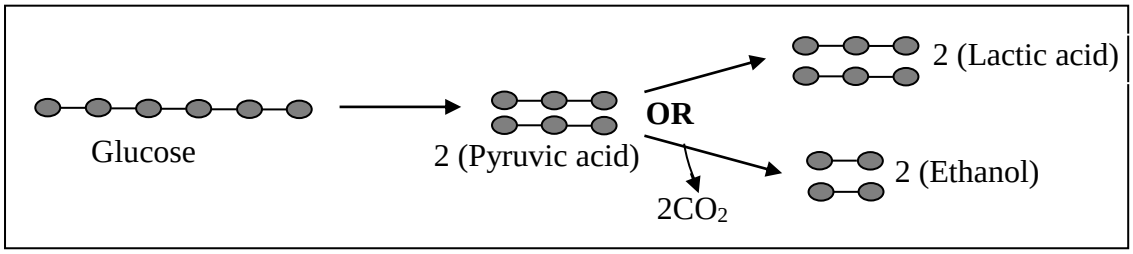
37. Consider the given reaction which occurs in the leaves of C4 plants.

$$CO_2 + \text{phosphoenolpyruvate (PEP)} \xrightarrow{\text{PEP carboxylase}} \text{Oxaloacetate}$$

The tissue of leaves in which this reaction occurs is

A. xylem vessels.
B. bundle-sheath.
C. sieve tubes.
D. mesophyll.

38. The given diagram summarises the reactions of anaerobic respiration.



Based on the given summary, adenosine triphosphate (ATP) molecules would have been released during the

A. breakdown of pyruvic acid into ethanol.
B. formation of pyruvic acid from glucose.
C. breakdown of pyruvic acid into lactic acid.
D. release of carbon dioxide gas from pyruvic acid.

39. In the digestive system of cockroach, the function of gizzard is to

A. grind the ingested food.
B. temporarily store the food.
C. secrete hydrolytic enzymes.
D. reabsorb water from the haemolymph.

40. All of the following are the constituents of human saliva EXCEPT

A. mucus.
B. sucrose.
C. amylase.
D. sodium bicarbonate.

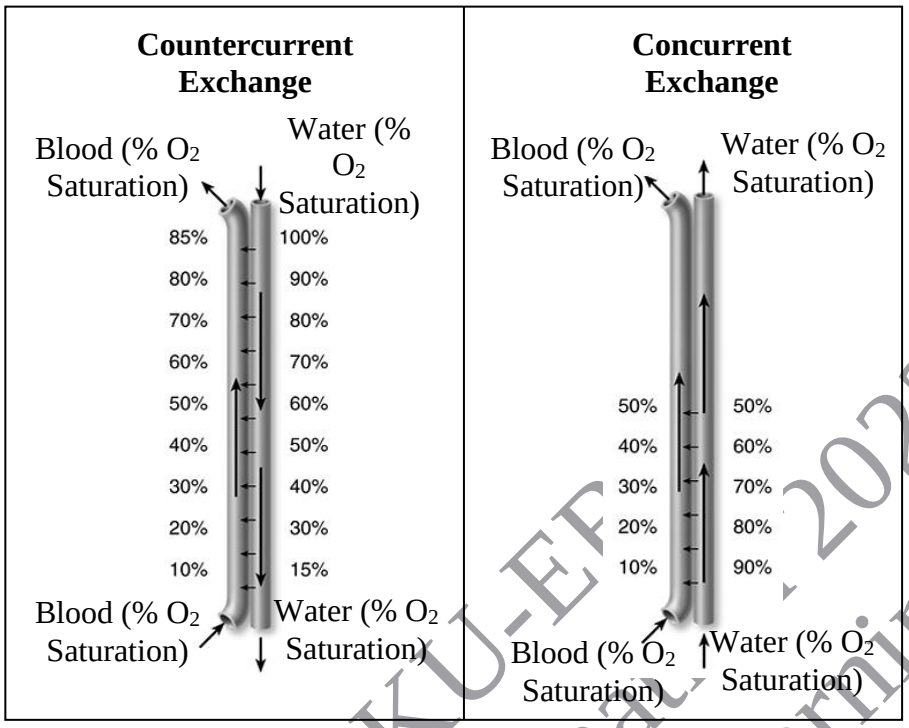
41. Venus flytrap is an insectivorous plant in which the organ specialised to trap insects is

A. buds.
B. roots.
C. leaves.
D. branches.

42. The structure that does NOT contribute to the large surface area of the ileum is the presence of

A. villi in the inner lining.
B. microvilli in the epithelium.
C. muscles in the muscularis layer.
D. circular folds in the mucosal layer.

43. The given diagram shows the difference between the countercurrent and concurrent exchange system in fish.



With reference to the given diagram, the option that depicts the CORRECT difference between these two systems is that it

	Countercurrent Exchange System	**Concurrent Exchange System**
A	is unidirectional.	is bidirectional.
B	maintains 20% pressure gradient.	maintains 30% pressure gradient.
C	allows more contact time between blood and water.	allows less contact time between blood and water.
D	retains O_2 concentration gradient between blood and water.	causes O_2 concentration gradient between blood and water to reach equilibrium.

44. In the chest X-ray of a patient, cavities in the lungs was observed due to a chronic bacterial infection.

On the basis of this observation, the disease is diagnosed as

A. tuberculosis.
B. emphysema.
C. lung cancer.
D. pneumonia.

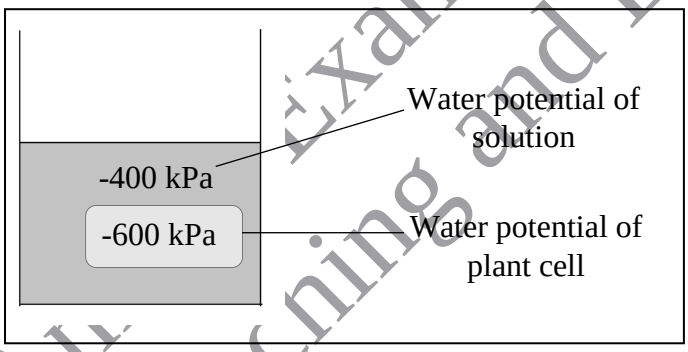
45. What happens to the muscles of diaphragm and internal intercostal muscles during exhalation in humans?

	Muscles of Diaphragm	Internal Intercostal Muscles
A	Contract	Contract
B	Contract	Relax
C	Relax	Relax
D	Relax	Contract

46. During atrial systole in the cardiac cycle of humans, the state of ventricles, atrioventricular valves and semilunar valves is

	Ventricles	Atrioventricular Valves	Semilunar Valves
A	relaxed	opened	opened
B	relaxed	opened	closed
C	contracted	closed	closed
D	contracted	closed	opened

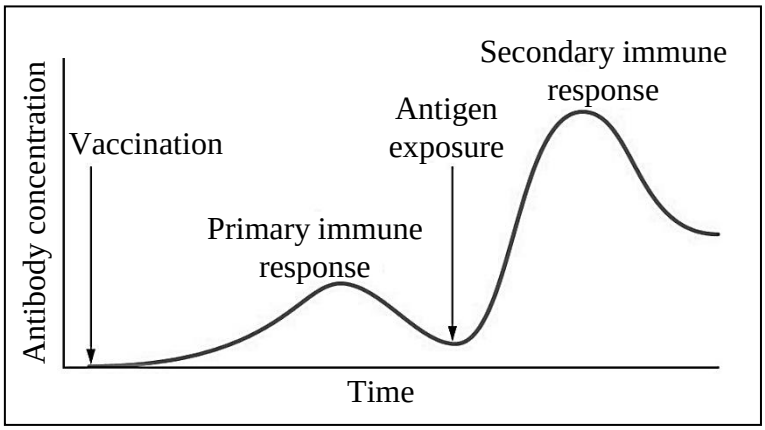
47. The given diagram shows the water potentials of a plant cell and the solution in which it was immersed for 10 minutes.



The option that shows the net movement of water, water potential of cell and effect of solution on cell is

	Net Movement of Water	Water Potential of Cell	Effect of Solution on Cell
A	into cell	becomes higher	becomes turgid
B	into cell	becomes lower	bursts
C	out of cell	becomes higher	swells
D	out of cell	becomes lower	becomes plasmolysed

48. The given graph shows the level of antibody in blood serum after vaccination and an exposure to the same antigen a few days later.



The antibody concentration is higher in secondary immune response because at this point, the

A. phagocytes have interacted with the antigen.
B. monocytes have invaded the infected tissues.
C. B-lymphocytes have matured in the bone marrow.
D. immunological memory has already been established.

49. If a plant cell with a solute potential of −0.65 kPa is placed in a solution having water potential of −3.65 kPa, then its pressure potential will be

A. 3.0 kPa.
B. 4.3 kPa.
C. −3.0 kPa.
D. −4.3 kPa.

50. An escape of blood from a ruptured blood vessel within the human body is termed as

A. haemorrhage.
B. atherosclerosis.
C. arteriosclerosis.
D. myocardial infarction.

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