

**AGA KHAN UNIVERSITY EXAMINATION BOARD
HIGHER SECONDARY SCHOOL CERTIFICATE**

CLASS XI

ANNUAL EXAMINATIONS 2022

Biology

Total Time: 2 hours 10 minutes

Total Marks: 65 (50-Theory & 15-Alternate to Practical)

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 65 only.
4. Question Distribution:

Theory	Alternate to Practical (ATP)
50 MCQs	15 MCQs

5. 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.

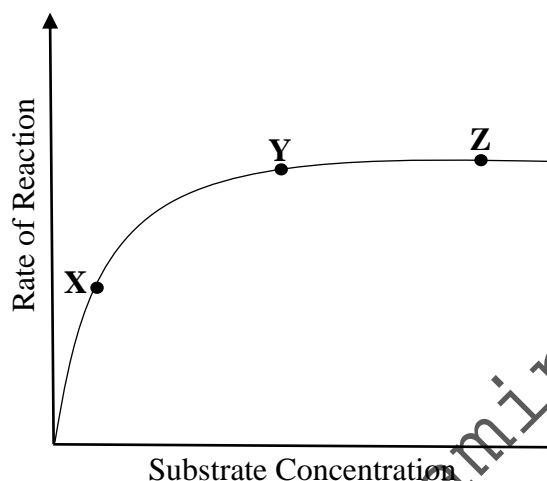
Correct Way	Incorrect Ways
1 (A) (B) (C) (D)	1 (A) (B) (C) (D)
	2 (A) (B) (C) (D)
	3 (A) (B) (C) (D)
	4 (A) (B) (C) (D)

Candidate's Signature

6. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
7. DO NOT write anything in the answer grid. The computer only records what is in the circles.
8. The marks obtained on the 50 MCQs will be equated to the total marks of 85 for the theory examination results.
9. You may use a scientific calculator if you wish.

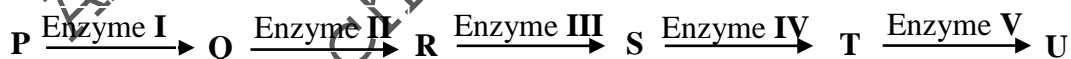
THEORY (Questions 1-50)

- Which of the following statements about the lock and key model is INCORRECT?
 - The active site is rigid in nature.
 - The active site is complementary to substrate.
 - The enzyme can react with specific substrates only.
 - The enzyme can react with a wide range of substrates.
- The graph shows the effect of substrate concentration on the rate of an enzyme-catalysed reaction.



The CORRECT interpretation of the graph is that between points

- X and Y the number of enzyme molecules is limiting the rate of reaction.
 - X and Y the number of product molecules is limiting the rate of reaction.
 - Y and Z the number of enzyme molecules is limiting the rate of reaction.
 - Y and Z the number of substrate molecules is limiting the rate of reaction.
- Consider the given enzyme-catalysed pathway regulated by feedback inhibition mechanism.



Which of the following statements is FALSE about this pathway?

- Compound U binds to the active site of enzyme I.
 - Enzyme I contains an allosteric site for compound U.
 - Enough production of compound U shuts off its own synthesis.
 - Compound U binds and causes a conformational change in enzyme I.
- The enzymes which catalyse the non-hydrolytic removal of a chemical group from a substrate are
 - lyases.
 - ligases.
 - isomerases.
 - transferases.

5. Spiral and determinate cleavage is found in the embryo of

- A. frog.
- B. leech.
- C. pigeon.
- D. brittle star.

6. Given are some of the invertebrates.

- I. Sycon
- II. Planaria
- III. Hydra

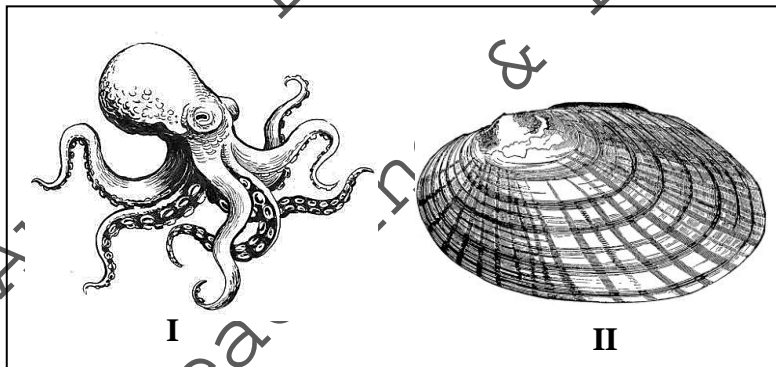
Asexual reproduction by budding is found in

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

7. In kingdom animalia, the beginning of cephalisation is evident in phylum

- A. porifera.
- B. protozoa.
- C. coelentrata.
- D. platyhelminthes.

8. The following diagrams show representative members of two classes of molluscs.

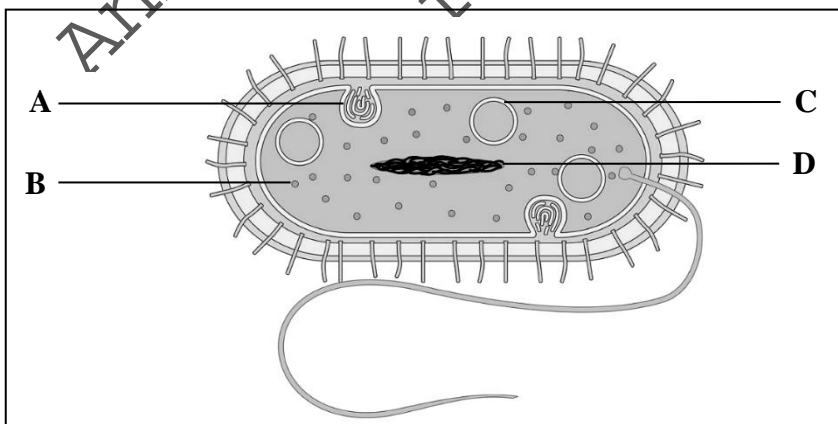


The CORRECT identification of the type of symmetry found in **I** and **II** is

	I	II
A	bilaterally symmetrical	asymmetrical
B	bilaterally symmetrical	bilaterally symmetrical
C	radially symmetrical	bilaterally symmetrical
D	asymmetrical	radially symmetrical

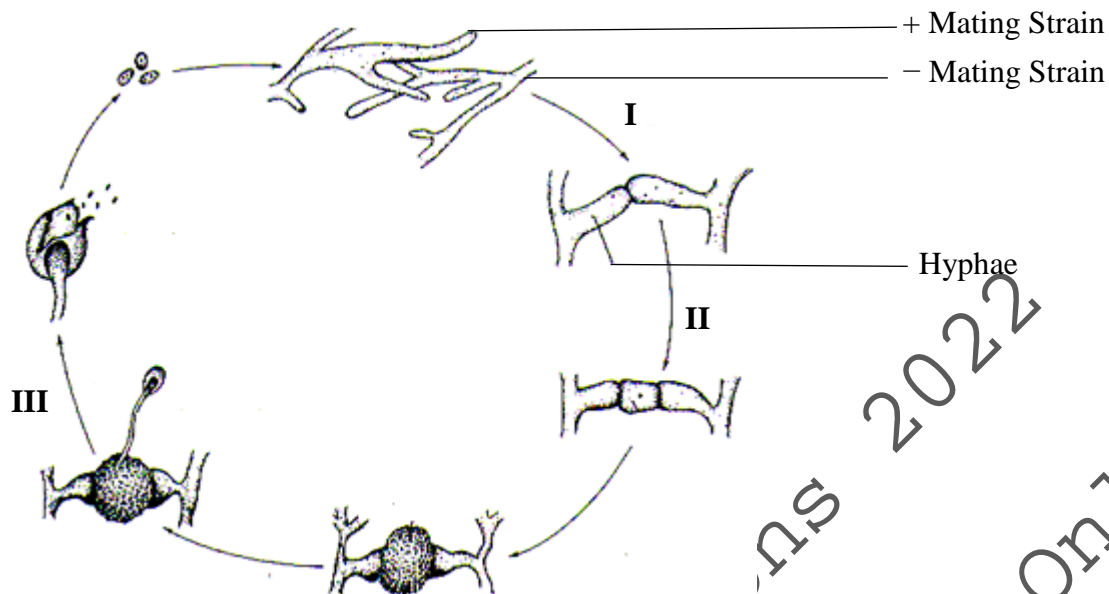
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9. The class of phylum arthropoda that lacks antennae and true jaws is
- A. insecta.
 - B. crustacea.
 - C. arachnida.
 - D. myriapoda.
10. In molluscs, closed circulatory system is found in the class(es)
- I. bivalvia
 - II. gastropoda
 - III. cephalopoda
- A. I only.
 - B. III only.
 - C. I and II.
 - D. II and III.
11. Reptiles become successful terrestrial vertebrates, MAINLY, due to the evolution of
- A. amniotic eggs.
 - B. moveable eyelids.
 - C. jointed jaw bones.
 - D. three chambered heart.
12. The feature of birds which is NOT considered as a flight adaptation is that their
- A. body is covered by feathers.
 - B. eggs are protected by shells.
 - C. bones are hollow and light in weight.
 - D. anterior limbs are modified into wings.
13. In the given diagram of a bacterial cell, respiratory enzymes are associated with the labelled part



14. Which of the following statements CORRECTLY describes the obligate anaerobic bacteria?
- A. They are killed by free oxygen.
 - B. They essentially need free oxygen.
 - C. They can live with or without free oxygen.
 - D. They obtain free oxygen from the host's body.
15. The disease that is caused by a microbe belonging to class apicomplexa is
- A. cholera.
 - B. malaria.
 - C. dysentery.
 - D. African sleeping sickness.
16. Photosynthetic protists with shells, composed of two halves, that fit together like a petri dish are
- A. diatoms.
 - B. actinopods.
 - C. foramaniferans.
 - D. dinoflagellates.
17. The feature which is similar in both phylums, ascomycota and basidiomycota, of kingdom fungi is the
- A. presence of septate hyphae.
 - B. absence of sexual reproduction.
 - C. use of conidia for asexual reproduction.
 - D. occurrence of eight sexual spores in internal sacs.
18. In ascomycetes, a round or oval fruiting body without any external opening which encloses the asci is identified as
- A. apothecium.
 - B. perithecium.
 - C. cleistothecium.
 - D. pseudothecium.

19. The given diagram shows the life cycle of a zygomycete.



The option that identifies the events that occur at stages I, II and III is

	I	II	III
A	plasmogamy	karyogamy	meiosis
B	karyogamy	plasmogamy	meiosis
C	plasmogamy	karyogamy	mitosis
D	karyogamy	plasmogamy	mitosis

20. A group of horticulturists observed that orchids do not show better growth unless an appropriate fungus lives close to their roots.

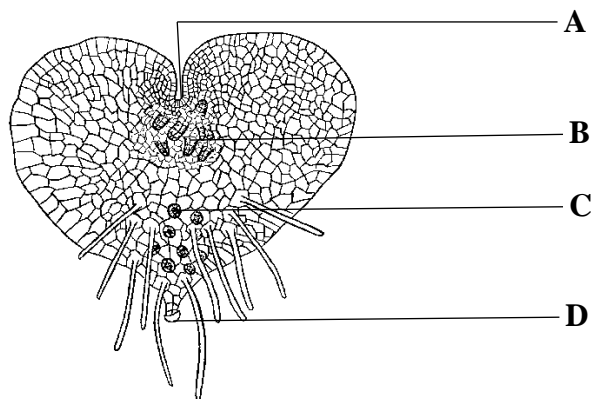
The given association between orchids and fungus is identified as

- A. lichen.
- B. mycorrhizae.
- C. saprophytic molds.
- D. parasitic mildews.

21. All of the following are the characteristics of bryophytes EXCEPT that they have

- A. same types of spores.
- B. multicellular embryo.
- C. dominant sporophyte.
- D. rhizoids to absorb water.

22. The growing point of the new sporophyte in the shown fern prothallus is labelled as



23. Sphenopsida are also called as arthropytes because their plant body

- A. has a bushy appearance.
- B. bears sporangia on sporangiophores.
- C. has large number of joints in the stem.
- D. stores granules of silica within the cells.

24. In the female gametophyte of an angiosperm, the ploidy of synergids, antipodal cells and central cell is

	Synergid	Antipodal Cell	Central Cell
A	haploid	haploid	haploid
B	haploid	haploid	diploid
C	diploid	diploid	diploid
D	diploid	diploid	haploid

25. Potatoes and tomatoes are economically important members of the family

- A. rosaceae.
- B. fabaceae.
- C. solanaceae.
- D. mimosaceae.

26. The option that CORRECTLY represents the characteristics of the sporophyte and gametophyte generations of a gymnosperm is

	Sporophyte Generation	Gametophyte Generation
A	independent and dominant	less conspicuous and dependent
B	less conspicuous and dependent	independent and dominant
C	dependent and dominant	more conspicuous and independent
D	more conspicuous and independent	dependent and dominant

27. In a light dependent reaction, the ultimate fate of electron (e^-) produced as a result of photolysis is the

(Note: NADP stands for Nicotine Amide Dinucleotide Phosphate; NADPH is the reduced form)

- A. fixation of CO_2 .
- B. formation of O_2 .
- C. reduction of NADP.
- D. oxidation of NADPH.

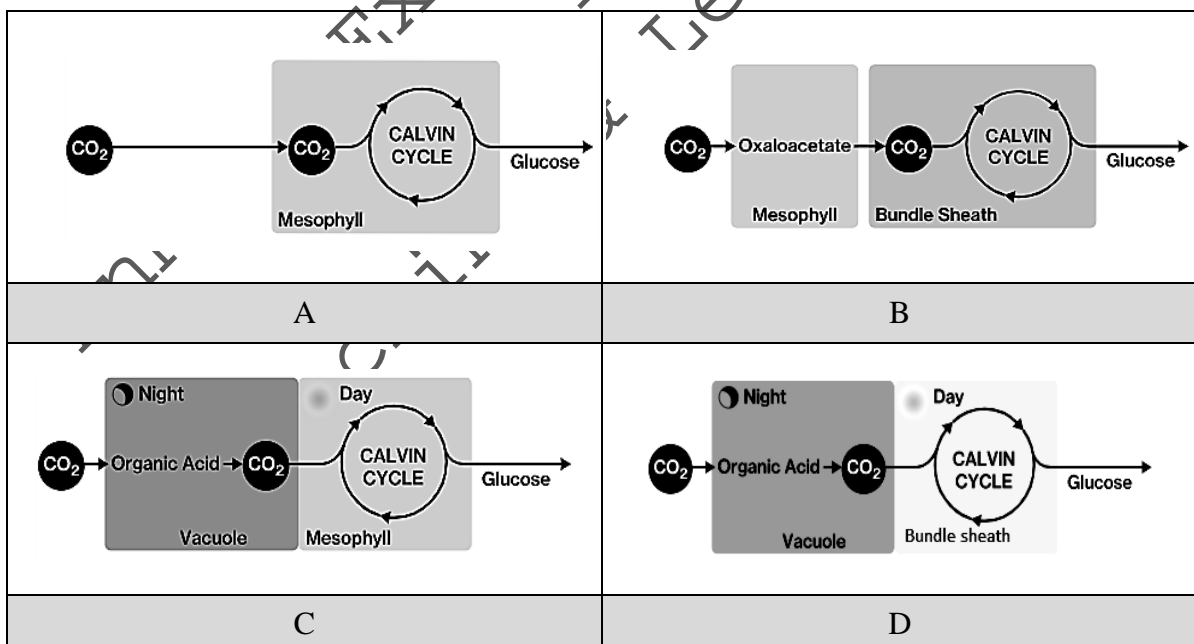
28. Consider the given molecules.

- NADPH
- ATP
- CO_2

In the process of photosynthesis, these molecules are used as inputs in the

- A. Krebs cycle.
- B. Calvin cycle.
- C. cyclic electron flow.
- D. non-cyclic electron flow.

29. Which of the following pathways shows carbon fixation in CAM (Crassulacean Acid Metabolism) plants?



30. In lactic acid fermentation, pyruvic acid converts into lactic acid by accepting electrons from

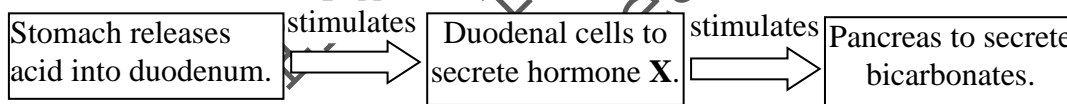
- A. NAD^+ .
- B. $NADP^+$.
- C. $NADH$.
- D. $NADPH$.

31. Given is the first step of Krebs cycle.



The product X is

- A. citrate.
 - B. malate.
 - C. fumarate.
 - D. succinate.
32. Insectivorous plants are autotrophs which grow in the soil that is deficient in
- A. nitrogen.
 - B. potassium.
 - C. phosphorus.
 - D. magnesium.
33. In humans, the large intestine is lined with mucus to
- A. increase the surface area for water absorption.
 - B. shield the intestinal wall against the altering pH.
 - C. assist the movement of undigested food material.
 - D. facilitate the membrane proteins in ion transportation.
34. The given flowchart shows the working of a gastrointestinal hormone.



Hormone X is identified as

- A. renin.
 - B. pepsin.
 - C. gastrin.
 - D. secretin.
35. In a human body, all of the following secretions contain enzymes for the digestion of dietary polysaccharides and disaccharides EXCEPT
- A. saliva.
 - B. gastric juice.
 - C. intestinal juice.
 - D. pancreatic juice.
36. The MAIN cause of peptic ulcer in humans is
- A. eating red meat.
 - B. vigorous exercises.
 - C. infection by *Helicobacter pylori*.
 - D. infection by *Entamoeba histolytica*.

37. One of the characteristics of lenticels in woody plants is that they
- have cells containing chloroplast.
 - are located in the stem epidermis.
 - are aerating pores that always remain open.
 - are openings in the stem of shrubs that are regulated.
38. In plants, the option that shows the range of environmental temperature and CO₂ to O₂ ratio which favours photorespiration is

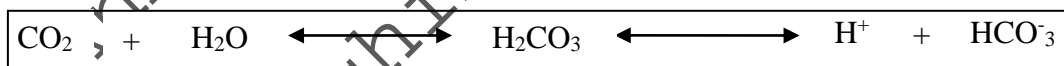
	Temperature	CO ₂ to O ₂ Ratio
A	low	low
B	low	high
C	high	low
D	high	high

39. Frogs use positive pressure breathing mechanism for ventilation by
- moving their ribs upward and out.
 - actively creating higher pressure in their mouth.
 - maintaining higher pressure in their internal nostrils.
 - using their diaphragm to create lower pressure in their lungs.

40. In cockroach, the site for gaseous exchange is

- cuticle.
- trachea.
- spiracle.
- tracheole.

41. What would be the site of the given reaction if it proceeds from right to left?



- Lungs
 - Trachea
 - Bronchus
 - Body tissue
42. During the chest examination of a patient by a stethoscope, the doctor observed some bubbling sounds that indicate the presence of fluid in the alveoli.

The possible respiratory disease diagnosed by the doctor will be

- asthma.
- sinusitis.
- bronchitis.
- pneumonia.

43. A plant cell has a water potential of -10 MPa and pressure potential of 2 MPa.

(Note: MPa stands for Mega Pascals.)

The solute potential of this cell will be

- A. -8 MPa.
- B. $+8$ MPa.
- C. -12 MPa.
- D. $+12$ MPa.

44. The pathway(s) through which water in root hair cells move to xylem cells in plants is/ are

- I. apoplast
- II. symplast
- III. vacuolar

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

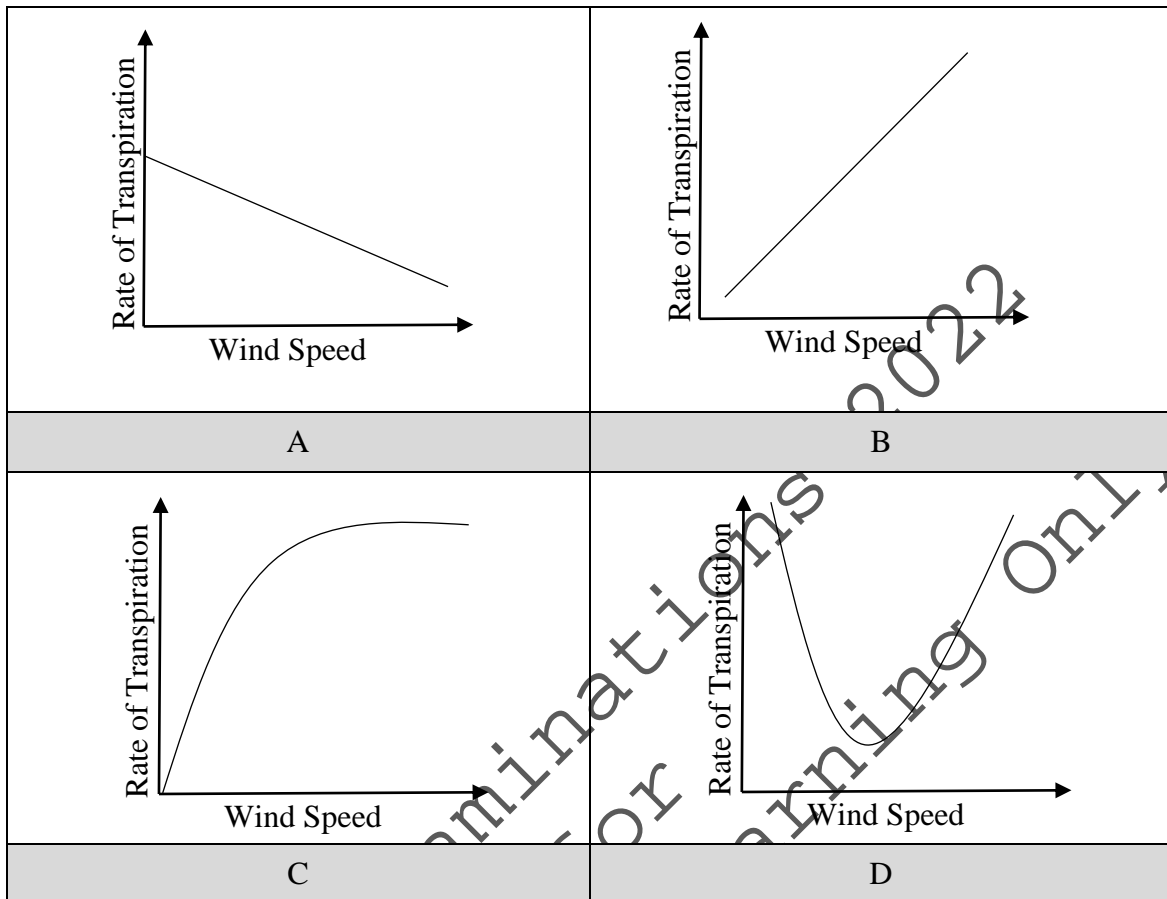
45. Given is the sequence of events that lead to the opening of stomata in plants during day light.

accumulation of substances X and Y in the guard cells \rightarrow increased solute concentration in the guard cells \rightarrow water potential of the guard cells Z \rightarrow endosmosis of water in the guard cells \rightarrow increased turgidity of the guard cells \rightarrow stomata opens

The letters X, Y and Z represent

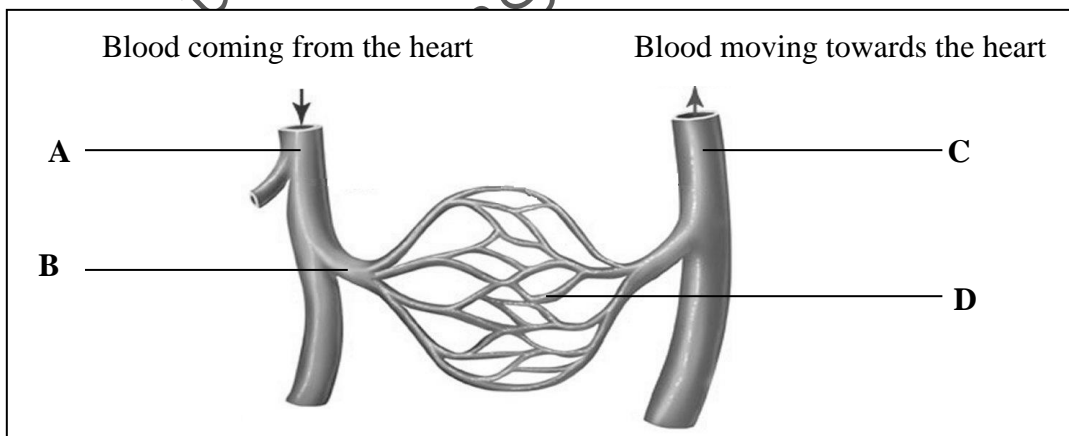
	X	Y	Z
A	carbon dioxide	potassium ions	decreases
B	glucose	potassium ions	decreases
C	carbon dioxide	hydrogen ions	increases
D	glucose	hydrogen ions	increases

46. The graph which illustrates the relation between wind speed and the rate of transpiration is



47. The given diagram shows different types of blood vessels involved in the blood circulation in the human body.

The blood vessel with the LOWEST rate of blood flow is



48. Following are the characteristics of a blood disorder.

- Reduced levels of haemoglobin
- Low RBCs production

The blood disorder identified is

- A. oedema.
- B. leukaemia.
- C. thalassaemia.
- D. atherosclerosis.

49. The option that depicts the pathway of nerve impulse during the excitation and the contraction of human heart is

(**Note:** SA stands for SinoAtrial and AV stands for AtrioVentricular.)

- A. SA node → AV node → Purkinje fibres → ventricles.
- B. SA node → Purkinje fibres → AV node → ventricles.
- C. AV node → SA node → Purkinje fibres → ventricles.
- D. AV node → Purkinje fibres → SA node → ventricles.

50. During ventricular systole in a cardiac cycle, the option that shows the change in pressure and the state of atrioventricular and aortic valves is

	Change in Pressure	Atrioventricular Valve	Aortic Valve
A	atrial pressure exceeds ventricular pressure	closes	opens
B	ventricular pressure exceeds atrial pressure	closes	opens
C	atrial pressure exceeds ventricular pressure	opens	closes
D	ventricular pressure exceeds atrial pressure	opens	closes

ALTERNATE TO PRACTICAL (ATP: Questions 51-65)

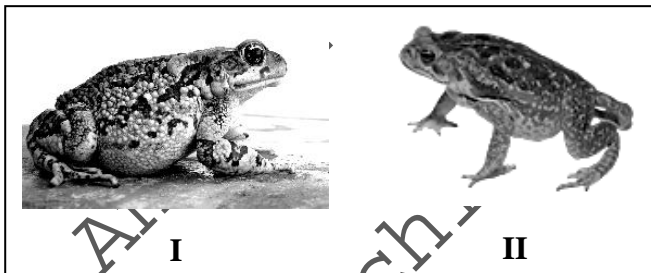
51. To evaluate the activity of salivary amylase enzyme, students collected samples (**I**, **II**, **III** and **IV**) of amylase-starch mixture at different times and added a drop of iodine reagent to each sample.

The given table shows the resulting colours and the amount of starch remaining in each sample.

Sample	Resulting Colours	Amount of Remaining Starch
I	Dark blue-black	All
II	Blue	Most
III	Golden brown	None
IV	Light brown	Some

Based on the resulting colours of the iodine test, the sample which shows the highest level of amylase activity is

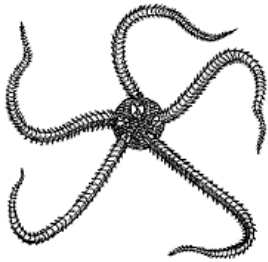
- A. I.
 B. II.
 C. III.
 D. IV.
52. The given diagram shows two specimen of class amphibia. Specimen **I** is a toad.



In contrast to specimen **II** (frog), specimen **I** (toad) has

- A. webbed feet.
 B. protruding eyes.
 C. longer legs for hopping.
 D. stout and chubby body shape.

53. The given image shows a specimen.



It is identified as

- A. hydra.
- B. star fish.
- C. jelly fish.
- D. brittle star.

Use the given information to answer Q.54 and Q.55.

A microbiologist used Gram staining method in a laboratory to identify different types of infectious bacteria in four different samples (I, II, III and IV). The given table shows the results.

Sample	Bacteria	Resulted Stain
I	<i>Escherichia coli</i>	Pinkish red
II	<i>Streptococcus pneumoniae</i>	Dark purple
III	<i>Streptococcus pyogenes</i>	Bluish purple
IV	<i>Salmonella typhi</i>	Red to pink

54. Based on the given results, Gram positive bacteria are found in sample(s)

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

55. Based on the results of sample I and IV, he infers that the cell walls of *Escherichia coli* and *Salmonella typhi* have

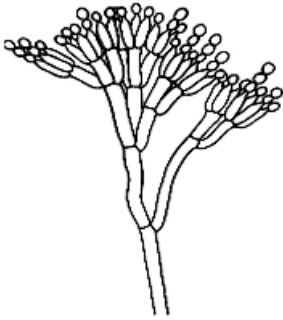
- A. thin peptidoglycan layer.
- B. thick peptidoglycan layer.
- C. outer membrane of lipoprotein.
- D. outer membrane of lipopolysaccharide.

56. In contrast to paramecium, euglena

- A. is heterotrophic.
- B. possesses two nuclei.
- C. use flagella for locomotion.
- D. is unicellular and eukaryotic.

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57. Given is the microscopic view of a fungal slide.

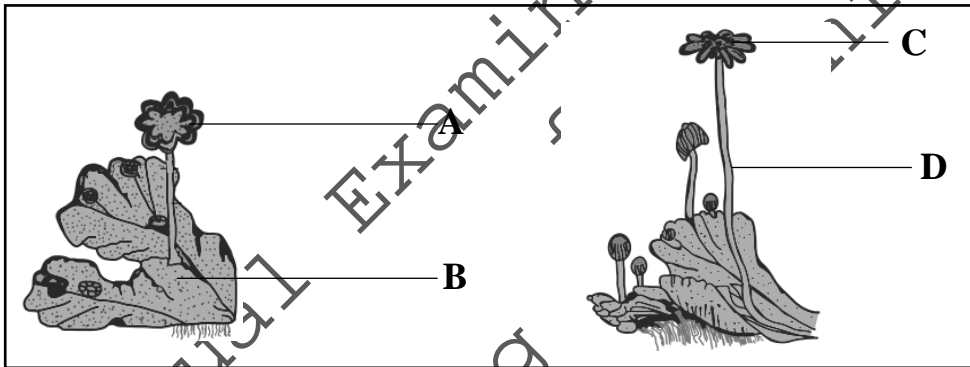


The fungus identified is

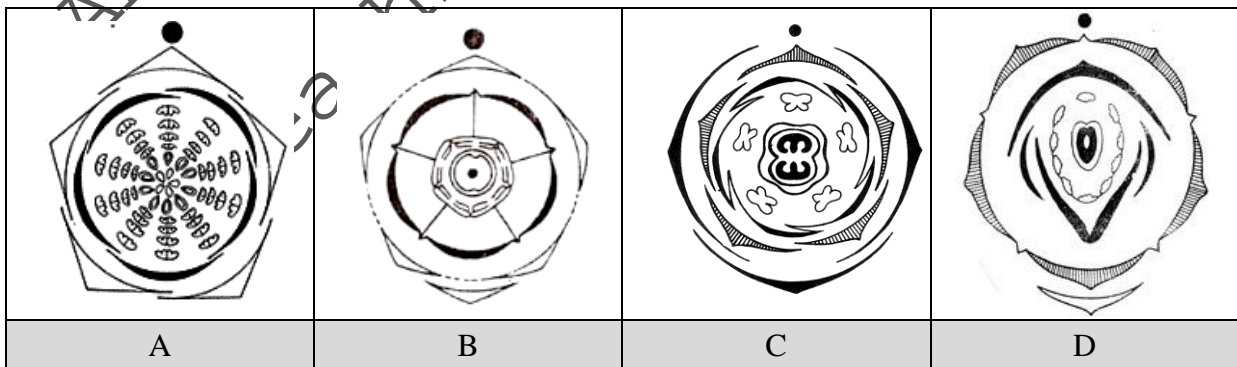
- A. yeast.
- B. rhizopus.
- C. mushroom.
- D. penicillium.

58. The given diagram shows two gametophytes of Marchantia plant.

The structure that bears antheridia is labelled as



59. The floral diagram that illustrates an epipetalous androecium is



60. The gynoecium of a flower is bicarpellary and syncarpous with superior ovary.

In the floral formula of this flower, gynoecium will be represented as

- A. $\underline{G}2$
- B. $G2$
- C. $\underline{G}(2)$
- D. $G(2)$

Use the given information to answer Q.61 and Q.62.

The given table shows the distance travelled by a solvent and the R_f values of different pigments obtained by paper chromatography.

Pigment	R_f Value	Distance Travelled by the Solvent
Chlorophyll a	0.65	10 cm
Chlorophyll b	0.45	
Carotene	0.95	
Xanthophyll	0.71	

61. The distance travelled by chlorophyll b is

- A. 4.5 cm.
- B. 0.45 cm.
- C. 0.045 cm.
- D. 0.0045 cm.

62. The pigment that has the highest solubility is

- A. carotene.
- B. xanthophyll.
- C. chlorophyll a.
- D. chlorophyll b.

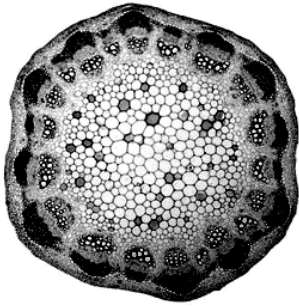
63. In the lungs of mammals, the adaptation(s) that prevent(s) the collapse of alveoli is/ are

- I. the presence of flexible bronchioles that lead to the alveoli
- II. the one cell thick walls of the alveoli
- III. the secretion of surfactant by the epithelial cells of alveoli

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

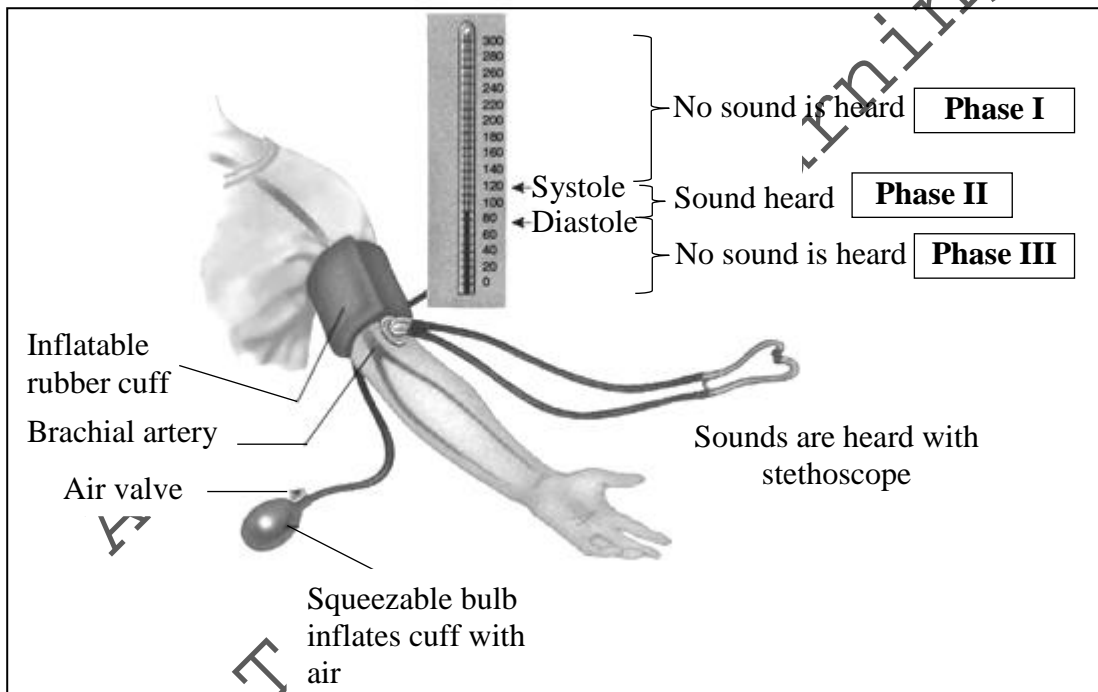
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64. The given diagram shows the microscopic view of a permanent slide.



This slide is CORRECTLY identified as the transverse section of a

- A. dicot root.
 B. dicot stem.
 C. monocot root.
 D. monocot stem.
65. The given diagram shows a method used by Alina to measure the blood pressure of her classmate. She heard a sound during phase II and noted the blood pressure as 120/80 mmHg (millimetres of mercury).



She infers that the sound was audible during phase II because the

- A. blood started to return to the brachial artery.
 B. the diameter of the lumen of brachial artery gets minimised.
 C. the pressure in the cuff is greater than the pressure on the artery.
 D. enough air pressure is pumped into the cuff which closes the artery.

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