CBSE
Class XI Biology

Time: 3 hrs **Total marks: 60**

General instructions:

1. All questions are compulsory.
2. This question paper consists of five sections A, B, C, D and E. Section **A** contains **5** questions of **one** mark each, Section **B** is of **4** questions of **two** marks each, Section **C** is of **11** questions of **three** marks each, Section **D** is of **1** question of **four** marks and Section **E** is of **2** questions of **five** marks each.
3. There is no overall choice. However, an internal choice has been provided in **one** question of **2** marks, **one** question of **3** marks and two questions of **5** marks weightage. A student has to attempt only one of the alternatives in such questions.
4. Wherever necessary, the diagrams drawn should be neat and properly labelled.

SECTION A

1. Mention two places where methanogens are present. [1]

2. What is the function of phloem parenchyma? [1]

3. Name two surface extensions in the bacterial cells which are not concerned with motility. [1]

4. Why are majority of plant nutrient elements called mineral nutrients? [1]

5. Name the cell which forms myelin sheath for the nerve fibres in PNS. [1]

SECTION B

6. [2]

i. Name three poisonous snakes.
ii. Why are they included in Class Reptilia?

7. Mention any two types of vacuoles found in animal cells along with their functions. [2]

OR

What are nucleic acids? Name the two types of nucleic acids.

8. Give two reasons why all minerals cannot be passively absorbed by the roots. [2]

9. Differentiate between absorption spectrum and action spectrum. [2]

SECTION C

10. Ctenophora and Cnidaria are diploblastic animals, while Chordates, Annelids and Arthropods are triploblastic. [3]

(a) What is meant by diploblastic animals?
(b) What are triploblastic animals?
(c) What value is represented here??

11. Where is the gizzard located in a cockroach? Explain its muscular arrangement and give its function. [3]

12. [3]

(a) What is the name given to the common axis where several leaflets are arranged?
(b) What does it represent morphologically?
(c) Give one difference between leaf and leaflet.

13. Draw illustrations to bring out the anatomical difference between monocot root and dicot root. [3]

14. What is cell wall? Mention the functions of a plant cell wall. [3]

15. Describe the following: [3]

(a) Synapsis (b) Bivalent (c) Chiasmata

Draw a diagram to illustrate your answer.

16. How does cytokinesis in plant cells differ from that in animal cells? [3]

17. How is ubiquinone reduced in the electron transport system? Where is it located? [3]

18. When any material or seeds are kept in water, they swell up. Name and define the phenomenon involved in this change. Describe the two conditions necessary for the phenomenon to occur. [3]

19. What would happen if HCl was not secreted in the stomach? [3]

20. What is the importance of plasma proteins? [3]

OR

Explain the process of transmission of a nerve impulse across a chemical synapse.

SECTION D

21. Read the passage and answer the questions which follow:

Mohan was sitting in the doctor's clinic. The doctor was examining the patient who was having a breathing problem. After examination, the doctor told the patient that he was suffering from silicosis which is incurable but that regular treatment could give him some relief. [4]

i. What are occupational disorders?
ii. What is silicosis?
iii. What is the effect of silica on the respiratory system?
iv. What lesson can one learn from this case?

SECTION E

22. Describe the transpiration pull model of water transport in plants. What are the factors influencing transpiration? How is it useful to plants? [5]

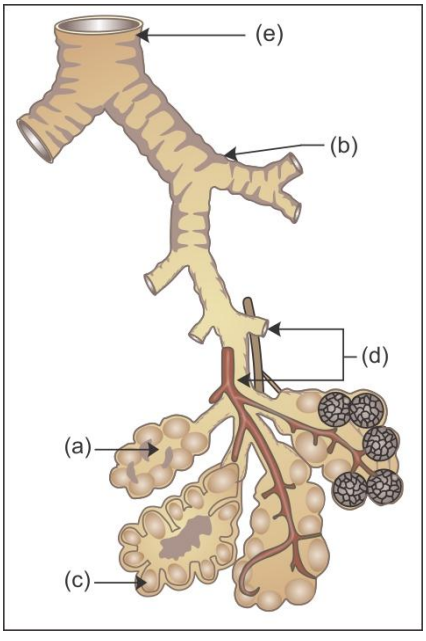
OR

What are the conditions necessary for fixation of atmospheric nitrogen by *Rhizobium*? What is the role of *Rhizobium* in N_2 fixation?

23. Give a brief account of the counter current mechanism. [5]

OR

i. Study the given figure of the respiratory passage and label parts a, b, c, d and e.
ii. How many secondary bronchi are there in the right and left human lungs?
iii. What is the approximate length and width of the human trachea?
iv. What is the role of the epiglottis?
v. In which body cavity are the lungs located?



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Solution

SECTION A

1.

i. Marshy areas
ii. Gut of ruminant mammals

2. It stores food materials, resins, latex and mucilage.

3. Pili and fimbriae

4. Majority of plant nutrient elements are derived from rock minerals; hence, they are called mineral nutrients.

5. Schwann cell

SECTION B

6.

i. Poisonous snakes: *Naja* (Cobra), Bangarus (Krait) and *Vipera* (viper)
ii. They are included in Class Reptilia due to their crawling mode of locomotion.

7.

i. In Amoeba, the contractile vacuole is involved in excretion and osmoregulation.
ii. In protists, food vacuoles contain digestive enzymes with the help of which nutrients are digested.

OR

Nucleic acids are long chain macromolecules formed by polymerisation of a large number of repeated units called nucleotides.
The two types of nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

8. All minerals cannot be passively absorbed by the roots from the soil for two reasons:

i. Minerals exist in the soil as ions which cannot directly cross the cell membranes.
ii. The concentration of minerals in the soil is usually lower than the concentration of minerals in the root.

9.

Absorption Spectrum	Action Spectrum
It is a graph plotted with the amount of light absorbed as a function of wavelength.	It is a graph plotted with the amount of photosynthesis (in terms of CO_2 fixed or O_2 liberated) as a function of wavelength.

SECTION C

10.

(a) An animal which has two layers of cells in its early embryonic stage is called a diploblastic animal.

(b) An animal which has three layers of cells in its early embryonic stage is called a triploblastic animal.

(c) There is always scope for change and improvement; this leads to innovations.

11. The gizzard follows the crop of the alimentary canal.

It is a thick-walled somewhat rounded structure. Its walls are muscular and greatly folded. Its wall consists of strong circular muscles. The gizzard has six teeth which help in grinding the food particles.

12.

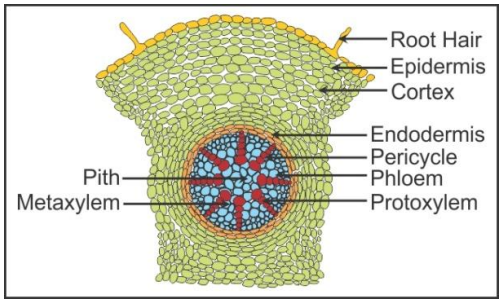
(a) It is called rachis.

(b) The rachis represents the midrib.

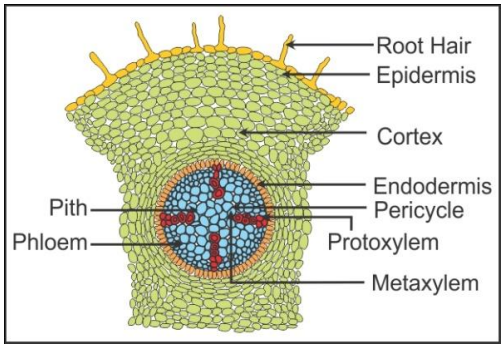
(c) A bud is present in the axil of a leaf, while a leaflet does not have a bud in its axil.

13. Anatomical difference between monocot root and dicot root:

i. Monocot root:



ii. Dicot root:



14. The cell wall is a non-living rigid structure which forms an outer covering for the plasma membrane of fungi, plants and some protists.

Functions of the cell wall:

(a) Protects the protoplasm against mechanical injury and infection

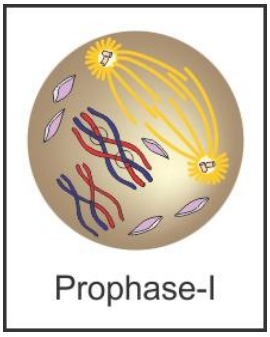
(b) Provides rigidity and shape to the cell

(c) Helps in cell-to-cell interactions

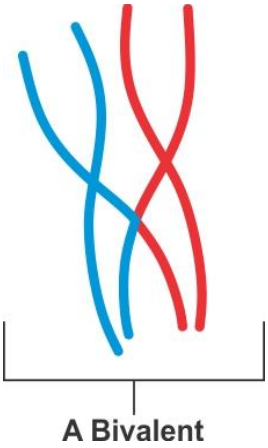
(d) Acts as a barrier to unwanted molecules

15.

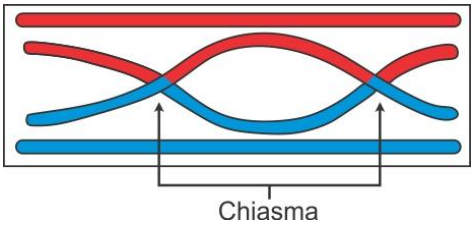
(a) Synapsis: During zygotene of prophase I of meiosis, homologous chromosomes pair together. This pairing is called synapsis.



(b) Bivalent: The complex formed by a pair of synapsed homologous chromosomes during zygotene of prophase I of meiosis is called a bivalent.



(c) Chiasmata: During diplotene, the paired chromosomes make a X-shaped structure. This is called chiasmata. These are the sites where crossing over between two non-sister chromatids occurs.



16. Differences between plant cytokinesis and animal cytokinesis:

Plant Cytokinesis	Animal Cytokinesis
(i) It occurs by cell plate formation.	(i) It occurs by cleavage.
(ii) The cell plate appears at the centre and extends outwards.	(ii) Cleavage begins at the periphery and proceeds inwards.
(iii) Fusion of vesicles begins cell plate formation.	(iii) Cleavage is started by contraction of the peripheral ring of microfilaments.

17. Ubiquinone receives the electrons after its oxidation by NADH dehydrogenase (Complex I). It also receives reducing equivalents through $FADH_2$ which is generated during oxidation of succinate through the activity of succinate dehydrogenase (Complex II). This leads to reduction of ubiquinone to ubiquinol.
Ubiquinone is located in the inner mitochondrial membrane.

18. The phenomenon involved is imbibition.
The absorption of water by the solid particles of an adsorbent without forming a solution is called imbibition.
The two conditions necessary are

i. Water potential gradient between the adsorbent and the liquid/water imbibed.
ii. Affinity between the adsorbent and the imbibed liquid.

19. HCl converts pepsinogen (proenzyme) and prorennin (proenzyme) into pepsin and rennin. It provides the acidic pH (pH 1.8) which is optimal for pepsin. Rennin is a proteolytic enzyme found in the gastric juice of infants which helps in the digestion of milk proteins. So, without HCl, infants would not be able to digest milk proteins.
HCl is also necessary to kill harmful bacteria which may be present in the food. In the absence of HCl, harmful bacteria will not be killed and may cause diseases.

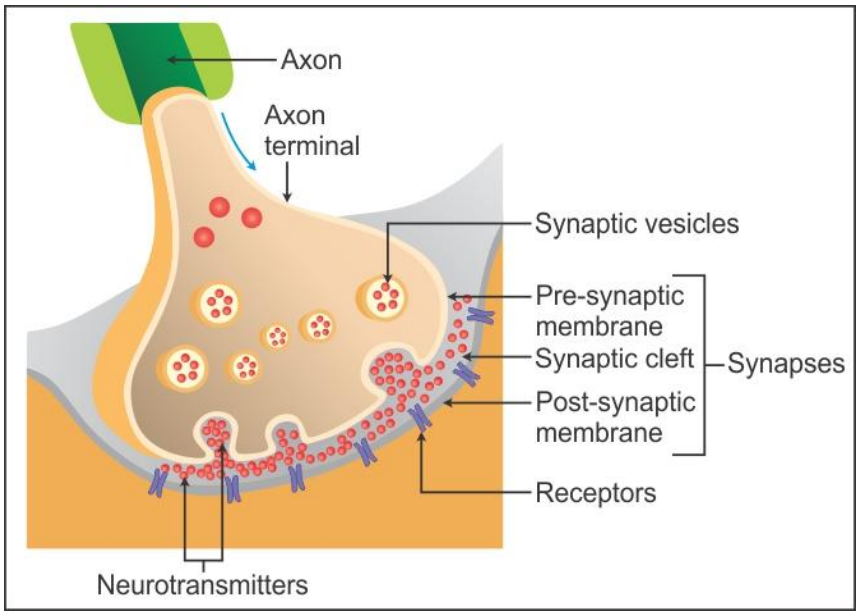
20. The major plasma proteins are fibrinogens, globulins and albumins.
Importance of plasma proteins:

i. Fibrinogens help in the clotting or coagulation of blood.
ii. Globulins, also called immunoglobulins, are involved in defence mechanisms of the body.
iii. Albumins and globulins retain water and thus help in maintaining the osmotic balance.
iv. Plasma proteins help in the uniform distribution of heat all over the body.

OR

Transmission of a nerve impulse across chemical synapse: The nerve impulse is conducted across the synapse always from the axon to the dendron with the help of chemicals called neurotransmitters. The transmission of a nerve impulse involves two processes—neurosecretion and chemoreception.

i. Neurosecretion: When a nerve impulse reaches the end knob of the axon, a large number of sodium and calcium channels open due to which ions diffuse rapidly inside and become more concentrated in the synaptic cleft. Inside the synaptic knob, calcium ions bind the proteinous release sites on the inner surface of the presynaptic membrane and stimulate the synaptic vesicles to secrete neurotransmitter chemicals.
ii. Chemoreception: It is characterised by the reception of neurotransmitters at some special proteinous molecular sites, the chemoreceptors, on the postsynaptic membrane. This chemoreception causes depolarisation of the membrane by opening the Na+ ion channels and initiates a new action potential on the next neuron.



SECTION D

21.

i. Occupational disorders are the diseases which occur in persons who work in an environment where they are constantly exposed to potentially harmful substances such as gas, fumes or dust.
ii. Silicosis is an occupational disease which occurs due to chronic exposure to silica.
iii. As a result of chronic exposure, there is fibrosis (proliferation of fibrous connective tissue) of the upper part of the lungs causing inflammation.
iv. Because silicosis is incurable, prevention is the only alternative. Measures such as the use of protective gear and clothing should be taken to minimise the exposure of harmful dust.

SECTION E

22. Xylem vessels are tubular structures extending from the roots to the top of the plant. The water is filled inside the xylem capillaries and forms a continuous water column due to the cohesion and adhesion properties of water. In plants, a pull called the transpiration pull is generated due to transpiration. Loss of water from the mesophyll cells causes a decrease in the water potential. The water moves from cell to cell along the water potential gradient. This exerts a pull, and the water filled in the xylem comes to a state of tension, which is generated at the top of the unbroken water column, is transmitted downwards from the stem and finally reaches the roots. This tension or pull results in the upward movement of water.

Factors affecting transpiration:

i. Temperature: The rate of transpiration increases with the increase in atmospheric temperature because the temperature increases the rate of water evaporation from the cell surface, opens the stomata and decreases the relative humidity of the atmosphere.
ii. Relative humidity: Relative humidity is the percentage of water vapour present in the air at a given time and temperature relative to the amount required to be present to make the air saturated at that temperature. The rate of transpiration is inversely proportional to the relative humidity.
iii. Light: In most plants, the stomata open in the presence of light and close in darkness. The rate of transpiration increases in the presence of light and decreases in darkness.
iv. Wind: Transpiration is lower in still air because the water vapour accumulates around the transpiring organs. The movement of air increases the rate of transpiration by removing the saturated air around the leaves.

Importance of transpiration:

i. Ascent of sap: Ascent of sap mostly occurs due to the transpiration pull exerted by the transpiration of water.
ii. Turgidity: Transpiration maintains the shape and structure of plant parts by keeping the cells turgid.
iii. Removal of excess water: Plants absorb far more amount of water than actually required by them. Thus, transpiration removes excess of water.
iv. Distribution of mineral salts: Mineral salts are mostly distributed by the rise of sap.

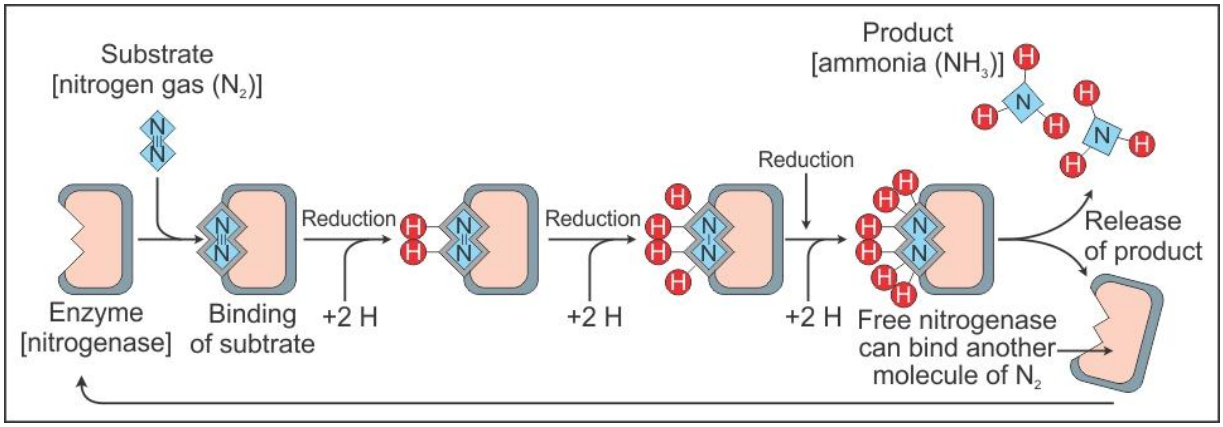
OR

The following conditions are necessary for fixation of atmospheric nitrogen by Rhizobium:

i. Reducing environment
ii. Presence of enzyme nitrogenase
iii. Source of energy as ATP
iv. Source of reducing power, NAD(P) H_2 or $FMNH_2$
v. Ferredoxin as electron donor
vi. Keto acids for picking up the amino group
vii. Reduced availability of nitrate in the substrate

Role of Rhizobium in N_2 fixation:

Rhizobium fixes nitrogen from the atmosphere into a plant usable form, ammonium, using the enzyme nitrogenase. In return, the plant supplies the bacteria with carbohydrates, proteins and sufficient oxygen so as not to interfere with the fixation process. Leghaemoglobin, a plant protein, helps to provide oxygen for respiration while keeping the free oxygen concentration low enough not to inhibit the nitrogenase activity.

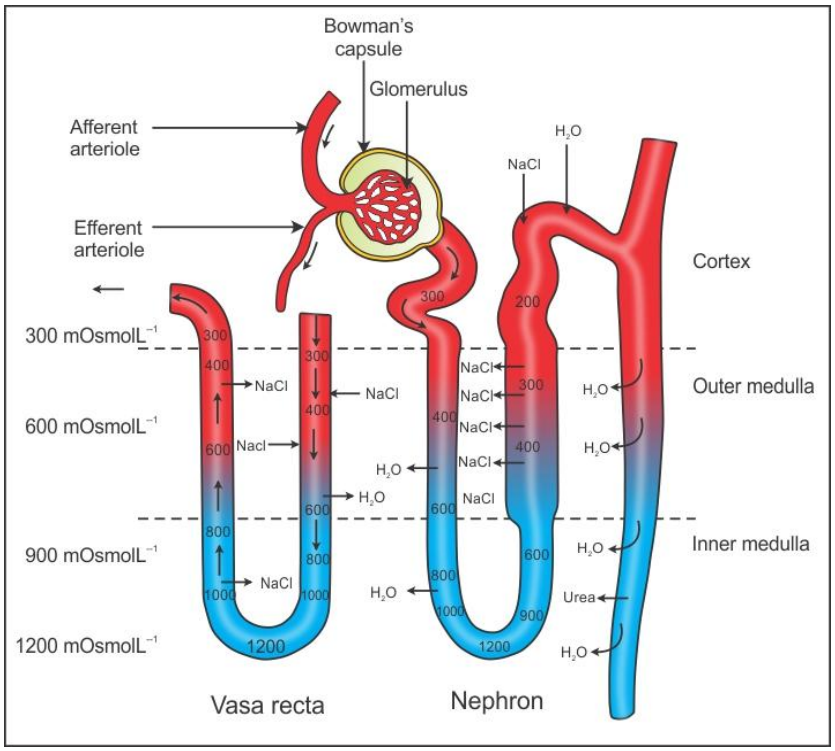


23. Henle's loop and vasa recta play an important role in counter current mechanism. Glomerular fluid in the Henle's loop and blood in the vasa recta flow in opposite directions and thus form a counter current mechanism which helps in concentrating the urine.

i. Henle's loop: The glomerular filtrate passes through the ascending limb of the loop of Henle. NaCl is transported by the ascending limb of Henle's loop. The increased concentration of the solutes, Na+ and Cl^- in the interstitial fluid draws out water by osmosis from the descending limb and from the collecting duct. The water enters the vasa recta and is carried away. This maintains the high concentration of solutes in the interstitial fluid around the loop of Henle and the collecting duct. This helps turn the isotonic glomerular filtrate into hypertonic urine.

ii. Vasa recta: The walls of vasa recta are permeable to ions, water and urea. As the blood flows in the descending capillary of the vasa recta towards the renal medulla, water is drawn out from the blood plasma by osmosis. Sodium and chloride ions and urea enter the plasma by diffusion. As the blood flows in the ascending capillary towards the renal cortex, water re-enters the plasma and Na^+, Cl^- and urea leave it due to a decrease in concentration of the interstitial fluid.

The counter current exchange in the vasa recta prevents the loss of sodium and chloride ions from the renal medulla and helps maintain the concentration gradient in the renal medulla. Hence, the counter current mechanism concentrates the urine by maintaining a high salt concentration and the production of hypertonic urine conserves the water in the body.



OR

i.
   (a) Alveolar sac
   (b) Secondary bronchus
   (c) Alveoli
   (d) Bronchioles
   (e) Trachea
ii. 3 in the right lung and 2 in the left lung
iii. 11 cm long and 2.5 cm wide
iv. It closes the glottis during swallowing to check the entry of food into the food pipe.
v. Thoracic cavity