

**CBSE**  
**Class XI Biology**

**Time: 3 hrs**

**Total marks: 60**

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**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.
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**SECTION A**

1. What names are given to the male and female sex organs of algae? [1]
2. What is meant by a sheathing leaf base? [1]
3. What is the function of the nucleolus? [1]
4. Mention one similarity between transport proteins and enzyme proteins. [1]
5. The proximal end of a nephron is closed. What is this modification? [1]

**SECTION B**

6. What is the difference between the two body forms—polyp and medusa—exhibited by cnidarians? [2]
7. Mention two factors on which imbibition depend. [2]
8. What is the role of antennae pigments of LHC? [2]

9. [2]  
(a) Who proposed the double helical model of DNA?  
(b) Why are the two strands of DNA described as antiparallel?

**OR**

- (a) Name any four sites where ribosomes are present in plant cells.

**SECTION C**

10. Name the type of fertilisation which is unique to angiosperms. Describe it. [3]
11. Underground parts of a plant are not always roots. Comment. [3]
12. Answer the following with reference to the anatomy of dicot root: [3]  
i. Where is the pericycle located?  
ii. How are xylem vessels arranged?  
iii. What do you call such an arrangement?
13. Draw a labelled diagram of the alimentary canal of a cockroach. [3]
14. What do you understand by the cytoskeleton present in the cell? What function does it perform? [3]
15. Find examples where the four daughter cells formed from meiosis are equal in size and where they are found unequal in size. [3]
16. Explain the terms: [3]  
i. Monoglyceride  
ii. Diglyceride  
iii. Triglyceride
17. What are the two crucial events in aerobic respiration? Where do these take place? [3]
18. How does oxidative phosphorylation differ from photophosphorylation? Explain. [3]

**OR**

Answer the following questions with reference to nitrogen:

- i. The form in which it is absorbed from the soil.  
ii. In which part of the plant is it required?  
iii. Two organic compounds in which it is a component.

19. [3]
- Explain how the thoracic chamber is a closed chamber.
  - Why is such a setup necessary?
  - Why is the larynx called the sound box?

20. How does progesterone function in a human female? [3]

#### SECTION D

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

Sohan became weak and pale, so his father took him to a doctor. The doctor diagnosed that he is suffering from jaundice and gave him some medicines. Sohan asked the doctor the cause of the disease and the precautions he should take. The doctor advised him to avoid the use of fats and uncovered food. [4]

- Which part of the digestive system is affected during jaundice?
- What are the major functions of the liver?
- Which pigments are involved in jaundice?
- Why did the doctor advise Sohan to avoid fats?

#### SECTION E

22. Give the diagrammatic representation of ETS and explain. [5]

OR

- With the help of well-labelled diagrams, describe the process of plasmolysis in plants, giving appropriate examples.
- Explain what will happen to a plant cell if it is kept in a solution with higher water potential.

23. [5]

- List the functional areas of the cerebral hemisphere and write one function of each.
- Draw a labelled diagram of a neuron.

OR

- Describe briefly the three parts of the large intestine.
- Draw a diagram of the human stomach and label its parts.
- What is peristalsis?

**CBSE**  
**Class XI Biology**  
**Solution**

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**SECTION A**

1. Male – Antheridia; Female – Oogonia
2. When the leaf base expands into a sheath covering the stem partially or wholly, it is called a sheathing leaf base.
3. The nucleolus is the site of active ribosomal RNA synthesis.
4. They are specific for a substance.
5. Bowman’s capsule

**SECTION B**

6. Cnidarians exhibit two body forms—polyp and medusa.

| <b>Polyp</b>   | <b>Medusa</b>   |
|--|---|
| The polyp form is sessile and cylindrical.<br>Example: Hydra | The medusa form is umbrella-shaped and free-swimming.<br>Example: Aurelia |

7. The amount of imbibition depends on
  - i. The water potential gradient between the adsorbent and the liquid/water imbibed.
  - ii. The affinity between the absorbent and the imbibed liquid.
8. They absorb different wavelengths of light and pass on the energy to the reaction centre.
9.
  - (a) Watson and Crick proposed the double helical model of DNA.
  - (b) The two strands are antiparallel because they run in opposite directions, one in the 5'-3' direction and the other in the 3'-5' direction.

**OR**

- i. Freely in the cytoplasm
- ii. Attached to ER in the cytoplasm
- iii. Inside mitochondria
- iv. Inside plastids

## SECTION C

**10.** Double fertilisation is unique to angiosperms. In this phenomenon, two male gametes are discharged by a pollen tube into the embryo sac of an ovule. One male gamete fuses with the female gamete to form a zygote. This fusion is called syngamy. A second male gamete fuses with the secondary nucleus to form the primary endosperm nucleus. This is called triple fusion.

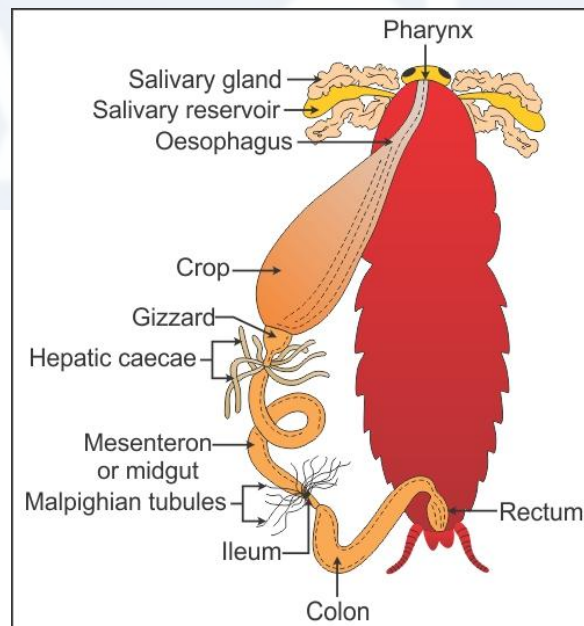
**11.** The underground parts of a plant are not always roots because

- i. Plants such as potato, ginger, onion and Colocasia have underground stems.
- ii. Underground stems show nodes and internodes.
- iii. They also have terminal buds and axillary buds.

**12.**

- i. The pericycle is positioned just inner to the endodermis.
- ii. The protoxylem elements are towards the external surface, while the metaxylem elements are found towards the core.
- iii. Such an arrangement of xylem is called exarch.

**13.** Alimentary canal of cockroach:



**14.** The cytoskeleton is an elaborate network of filamentous proteinaceous structures present in the cytoplasm.

**Functions of the cytoskeleton:**

- i. Cytoskeletal structures maintain the shape of the cell and its extensions.
- ii. It regulates orientation and distribution of cell organelles.
- iii. It helps in the intracellular transport and movement of cells.

**15.**

- i. The four microspores formed by meiosis in a microspore mother cell are equal.
- ii. The four spermatids formed from a spermatocyte are equal.
- iii. When a primary oocyte undergoes meiosis I, a large secondary oocyte and a small cell, the polar body, are formed.

**16.**

- i. Monoglyceride is a lipid with one molecule of glycerol and one molecule of fatty acid.
- ii. Diglyceride is a lipid with one molecule of glycerol and two molecules of fatty acids.
- iii. Triglyceride is a lipid with one molecule of glycerol and three molecules of fatty acids.

**17.** The important events in aerobic respiration are

- i. The complete oxidation of pyruvate by the step-wise removal of all the hydrogen atoms with the release of three molecules of carbon dioxide.
- ii. The passing on the electrons removed as part of the hydrogen atoms to molecular  $O_2$  along with the synthesis of ATP.

The first step takes place in the matrix of the mitochondria, while the second step occurs in the inner membrane of the mitochondria.

**18.** Net products of glycolysis:

- i. In glycolysis, two molecules of ATP are consumed during double phosphorylation of glucose to form fructose 1, 6 biphosphate.
- ii. Four molecules of ATP are produced by substrate-level phosphorylation (conversion of 1, 3 biphosphoglycerate to 3-phosphoglycerate and phosphoenolpyruvate to pyruvate).
- iii. Two molecules of  $NADH_2$  are formed at the time of oxidation of glyceraldehyde 3-phosphate to 1, 3 biphosphoglycerate.
- iv. The net reaction is as follows:  
$$\text{Glucose} + 2\text{NAD}^+ + 2\text{ADP} + 2\text{H}_3\text{PO}_4 \rightarrow 2\text{pyruvate} + 2\text{NADH} + 2\text{H}^+ + 2\text{ATP}$$
- v. Each  $NADH$  is equivalent to 3 ATP, so that the net gain in glycolysis is 8 ATP.

**OR**

- i. It is absorbed as  $\text{NO}_3^-$ ,  $\text{NO}_2^-$  and  $\text{NH}_4^+$  ions.
- ii. It is required in the meristematic tissues and metabolically active cells.
- iii. It is a constituent of nucleic acids, amino acids, vitamins, proteins etc.

**19.**

- i. The thoracic chamber is a closed chamber. It is formed dorsally by the vertebral column. The ventral side is formed by the sternum. It has ribs on the lateral side, and the lower side is formed by the dome-shaped diaphragm.
- ii. It is necessary because any change in the volume of the thoracic cavity will be reflected in the pulmonary cavity.
- iii. The larynx is called the sound box because it has vocal cords which vibrate to produce sound.

**20.**

- i. Progesterone helps to maintain pregnancy.
- ii. It stimulates the secretion of milk.
- iii. Its secretion is influenced by the luteinising hormone of the anterior pituitary.

#### **SECTION D**

**21.**

- i. Liver
- ii. It helps in the digestion of fats, regulation of blood sugar, formation of red blood cells, deamination, blood clotting etc.
- iii. Bile pigments
- iv. In jaundice, the liver is affected; as a result, bile production is also affected making digestion of fats difficult.

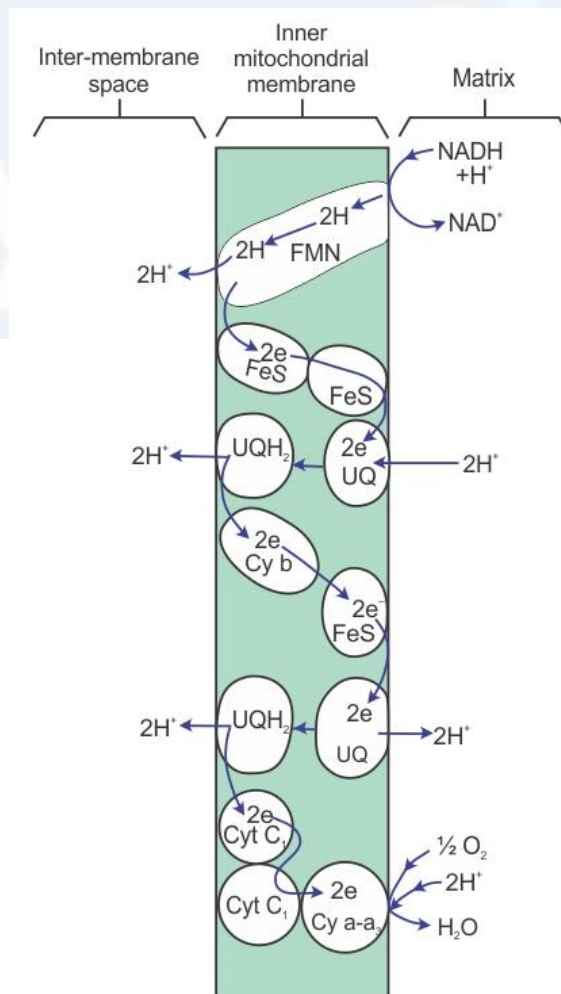
#### **SECTION E**

**22.** An electron transport system (ETS) is a series of coenzymes and cytochromes which take part in the passage of electrons from a chemical to its ultimate acceptor.

The passage of electrons from one enzyme or cytochrome to the next is accompanied with the loss of energy at each step. At each step, the electron carriers include flavins, iron sulphur complexes, quinones and cytochromes. The inner mitochondrial membrane possesses five complexes. Complex V is concerned with ATP synthesis. Complexes I to IV are involved in electron transport. These complexes are arranged in a definite sequence in the inner mitochondrial membrane. Reduced coenzymes transfer their electrons and protons through ETS in the following manner:

- i. Transfer of hydrogen from  $\text{NADH} + \text{H}^+$  to metalloflavoprotein-FMN (flavin mononucleotide). FMN gets reduced to  $\text{FMNH}_2$  and the coenzyme  $\text{NADH} + \text{H}^+$  gets oxidised to  $\text{NAD}^+$ . Oxidation of  $\text{NADH}$  occurs by complex I.
- ii. Reduced FMN (i.e.  $\text{FMNH}_2$ ) then transfers its electrons to Fe-S protein (iron sulphur protein) and  $2 \text{H}^+$  into the inner membrane space.
- iii. The reduced Fe-S protein then transfers its electrons to ubiquinone (UQ). UQ takes two electrons from Fe-S protein and two protons ( $2 \text{H}^+$ ) from the matrix to become  $\text{UQH}_2$ .

- iv. Reduced ubiquinone (UQH<sub>2</sub>) then transfers its electrons to cytochrome b and 2 H<sup>+</sup> to the other side into the inner membrane space. FADH<sub>2</sub> reduced in the Krebs cycle also enters through complex II into ETS by transferring its 2 H to UQ. UQ is reduced to UQH<sub>2</sub>.
- v. NADH+H<sup>+</sup> reduced in glycolysis also enters ETS. NADH reduces a flavoprotein-containing NADH-dehydrogenase located on the outer surface of the inner mitochondrial membrane.
- vi. The reduced flavoprotein (FPH<sub>2</sub>) then enters the main pathway by transferring 2 H to UQ. The reduced UQ then transfers its electrons to complex III and 2 H<sup>+</sup> to the outer side.
- vii. Reduced cytochrome b then transfers its electrons to Fe-S protein. The Fe<sup>3+</sup>-S is converted to Fe<sup>2+</sup>-S. This protein transfers electrons to UQ which also takes 2 H<sup>+</sup> from the inner matrix to become UQH<sub>2</sub>.
- viii. The reduced UQ (i.e. UQH<sub>2</sub>) transfers its electrons to cytochrome c<sub>1</sub> and a third pair of H<sup>+</sup> is transported outwardly.
- ix. Reduced cytochrome c<sub>1</sub> then reduces cytochrome c by transferring its electrons.
- x. The electrons from cytochrome c are then transferred to O<sub>2</sub> via cyt a and cyt a<sub>3</sub>.

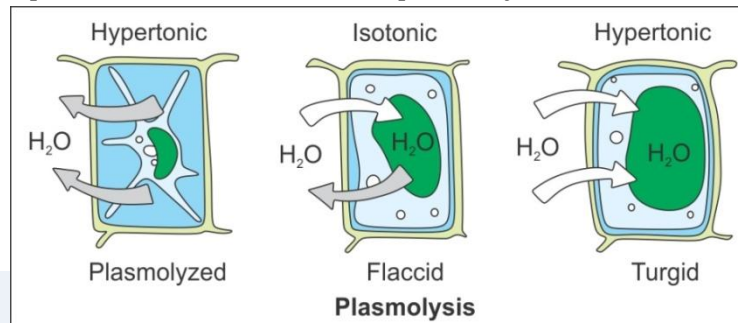


OR



(a) Plasmolysis is the shrinkage of the protoplast from the cell wall under the influence of a hypertonic solution.

If a plant cell is placed in a highly concentrated sugar or salt solution, water from the cell sap flows out due to exosmosis through the plasma membrane outside the cell. This causes contraction or shrinkage of the protoplast. Because the cell wall has very less elasticity, it cannot keep pace with the contraction of the plasma membrane. Ultimately, the protoplasm separates from the cell wall and assumes a spherical shape. This condition is called plasmolysis.



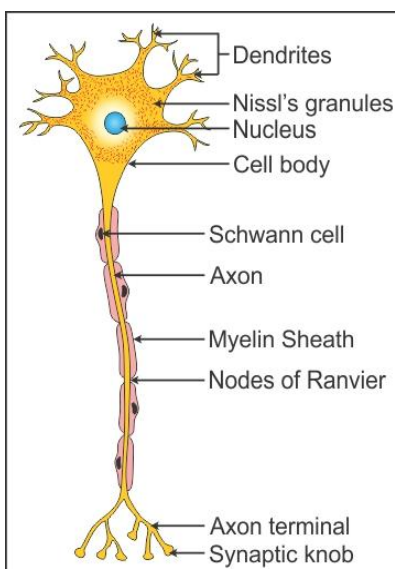
(b) Higher water potential occurs in a hypotonic or dilute solution. A plant cell present in such a solution will absorb water due to endosmosis. It will become turgid or swollen. The swollen protoplast develops a wall pressure which becomes equal to the water potential of the system which causes endosmosis to stop.

23.

(a) In each cerebral hemisphere, the cerebral cortex contains three types of functional areas:

- i. Sensory areas: They receive impulses from the receptors.
- ii. Motor areas: They transmit impulses to the effectors.
- iii. Association areas: They interpret the input, store the input and initiate a response in light of similar experience; thus, they are responsible for intersensory associations, memory and communication.

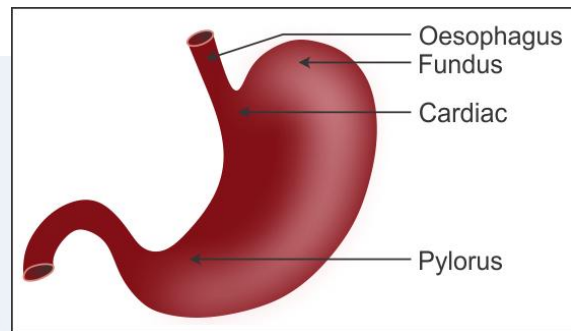
(b)



**OR**

- (a) The large intestine whose diameter is larger than that of the small intestine is about 1.5 metres long and divisible into three parts:
- Caecum: It is a small blind sac which harbours some symbiotic microorganisms. The vermiform appendix is a vestigial organ which arises from the caecum. The caecum opens into the colon.
  - Colon: The colon is divided into three parts—an ascending, transverse and descending part. The descending part opens into the rectum through the sigmoid colon.
  - Rectum: The rectum comprises the last 20 centimetres of the digestive tract and terminates in the 2-centimetre long anal canal. The opening of the anal canal is called the anus.

(b)



- (c) Peristalsis refers to the involuntary contractions of smooth muscles which spread like waves along the muscles.