CBSE
Class XI Biology
Sample Paper – 1

Time: 3 hrs **Total marks: 70**

General instructions:

1. All questions are compulsory.
2. The question paper consists of four sections A, B, C and D.
3. Internal choice is given in all the sections. A student has to attempt only one of the alternatives in such questions.
4. Section A contains 5 questions of 1 mark each.
5. Section B has 7 questions of 2 marks each.
6. Section C is of 12 questions of 3 marks each.
7. Section D has 3 questions of 5 marks each.
8. Wherever necessary, the diagrams drawn should be neat and properly labelled.

SECTION A

1. What are the names given to the male and female sex organs of algae? [1]

OR

Why are bryophytes called amphibians of the plant kingdom?

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]

OR

What is the function of catalase?

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]

OR

List four sinks for mineral elements or ions in plants.

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.

10. Differentiate between red algae and brown algae. [2]

11. Name the kind of tissue which [2]

i. stores starch in potato

ii. forms the shell in nuts

12. How are amino acids in a protein held together? [2]

SECTION C

13. Name the type of fertilisation which is unique to angiosperms. Describe it. [3]

14. Underground parts of a plant are not always roots. Comment. [3]

OR

Mention the characteristics of the cells in the region of the meristem in roots.

15. 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?

16. Draw a labelled diagram of the alimentary canal of a cockroach. [3]

17. What do you understand by the cytoskeleton present in the cell? What function does it perform? [3]

OR

Differentiate between primary cell wall and secondary cell wall.

18. Find examples where the four daughter cells formed from meiosis are equal in size and where they are found unequal in size. [3]

19. Explain the terms: [3]

i. Monoglyceride
ii. Diglyceride
iii. Triglyceride

20. What are the two crucial events in aerobic respiration? Where do these take place? [3]

21. 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.

22. [3]

i. Explain how the thoracic chamber is a closed chamber.
ii. Why is such a setup necessary?
iii. Why is the larynx called the sound box?

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

OR

Mention any four activities regulated by oestrogen hormone.

24. What are the factors affecting the rate of diffusion? [3]

SECTION D

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

OR

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

26. [5]

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

OR

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

27. Name the components of the formed elements in the blood and mention one major function of each of them. [5]

OR

Describe the process of digestion of carbohydrates in the human alimentary canal.

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Class XI Biology
Sample Paper – 1 Solution

SECTION A

1. Male – Antheridia; Female – Oogonia

OR

Bryophytes can live on land but depend on water for sexual reproduction. Hence, bryophytes are called amphibians of the plant kingdom.

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.

OR

Catalase catalyses the breakdown of hydrogen peroxide into water and oxygen.

5. Bowman's capsule

SECTION B

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

Polyp	Medusa
The polyp form is sessile and cylindrical. Example: Hydra	The medusa form is umbrella-shaped and free-swimming. 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.

OR

<u>Sinks for mineral elements or ions in plants:</u>

- Apical and lateral meristems
- Young leaves
- Storage organs
- Developing flowers, fruits and seeds

8. They absorb the 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

10. Differences between red algae and brown algae:

Red algae	Brown algae
1. They have a characteristic pigment – phycoerythrin.	1. They have a characteristic pigment – fucoxanthin.
2. They do not have any flagellated or motile structures.	2. They have flagellated gametes and zoospores.
3. Reserve food material is in the form of floridean starch.	3. Reserve food material is in the form of laminarin and mannitol.
4. Agar and carrageen are the phycocolloids.	4. Algin is the phycocolloid.

11.

i. stores starch in potato - Parenchyma
ii. forms the shell in nuts - Sclerenchyma

12. Amino acids in a protein are held together by a peptide bond which is formed when the carboxyl (-COOH) group of one amino acid reacts with the amino ($-NH_2$) group of the next amino acid with the elimination of a water molecule.

SECTION C

13. 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.

14. 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.

OR

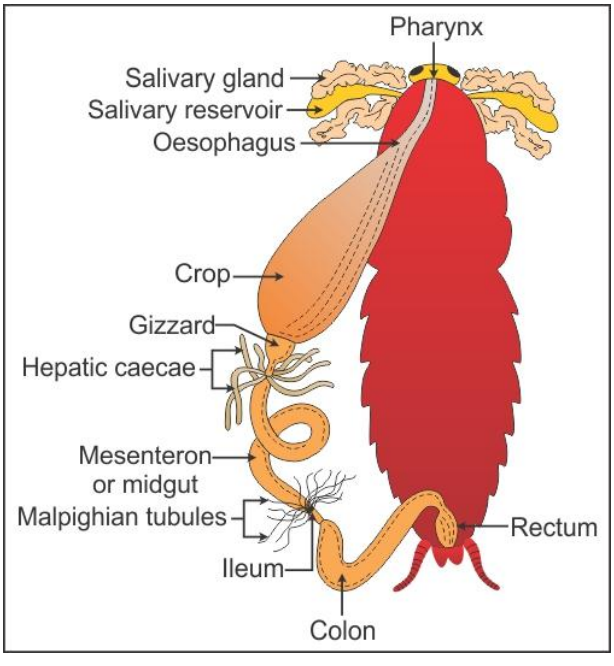
Characteristics of the cells in the region of the meristem in roots:

- Small in size
- Thin-walled
- Dense protoplasm
- Divide repeatedly

15.

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 the xylem is called exarch.

16. Alimentary canal of cockroach:



17. 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 the orientation and distribution of cell organelles.
iii. It helps in the intracellular transport and movement of cells.

OR

Differences between primary cell wall and secondary cell wall:

Primary cell wall	Secondary cell wall
• It is the cell wall of young cells.	• It is the cell wall formed inner to the primary wall in older cells.
• It is traversed by plasmodesmata.	• It is traversed by pits.
• It is made of mainly cellulose.	• It is made of lignin, pectin and suberin.

18.

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.

19.

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.

20. 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.

21. 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:

$$\text{Glucose} + 2\text{NAD} + + 2\,\text{ADP} + 2\text{H}_3\text{PO}_4 \; 2\,\text{pyruvate} + 2\,\text{NADH} + 2\text{H} + \; + 2\,\text{ATP}$$

v. Each NADH is equivalent to 3 ATP, so that the net gain in glycolysis is 8 ATP.

OR

i. It is absorbed as NO_3^-, NO_2^- and 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.

22.

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 a 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.

23.

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.

OR

<u>Activities regulated by oestrogen hormone:</u>

- Growth and functions of the female secondary sex organs
- Appearance of female sexual characters
- Development of mammary glands
- Development of ovarian follicle
- Female sexual behaviour

24. <u>Factors affecting the rate of diffusion:</u>

- Concentration gradient
- Permeability of the membrane
- Properties of the substance
- Temperature
- Pressure

25. 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 NADH + H^+ to metalloflavoprotein-FMN (flavin mononucleotide). FMN gets reduced to $FMNH_2$ and the coenzyme NADH+H^+ gets oxidised to NAD^+. Oxidation of NADH occurs by complex I.

ii. Reduced FMN (i.e. $FMNH_2$) then transfers its electrons to Fe–S protein (iron sulphur protein) and 2 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 H^+) from the matrix to become UQH_2.

iv. Reduced ubiquinone (UQH_2) then transfers its electrons to cytochrome b and 2 H^+ to the other side into the inner membrane space. $FADH_2$ reduced in the Krebs cycle also enters through complex II into ETS by transferring its 2 H to UQ. UQ is reduced to UQH_2.

v. NADH+H^+ reduced in glycolysis also enters ETS. NADH reduces a flavoprotein-containing NADH-dehydrogenase located on the outer surface of the inner mitochondrial membrane.

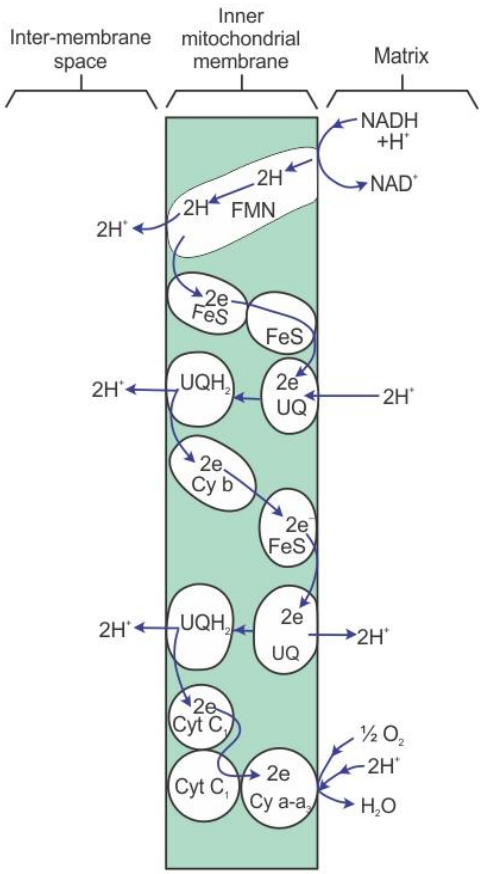
vi. The reduced flavoprotein (FPH_2) then enters the main pathway by transferring 2 H to UQ. The reduced UQ then transfers its electrons to complex III and 2 H^+ to the outer side.

vii. Reduced cytochrome b then transfers its electrons to Fe–S protein. The Fe^{3+}–S is converted to Fe^{2+}–S. This protein transfers electrons to UQ which also takes 2 H^+ from the inner matrix to become UQH_2.

viii. The reduced UQ (i.e. UQH_2) transfers its electrons to cytochrome c_1 and a third pair of H^+ is transported outwardly.

ix. Reduced cytochrome c_1 then reduces cytochrome c by transferring its electrons.

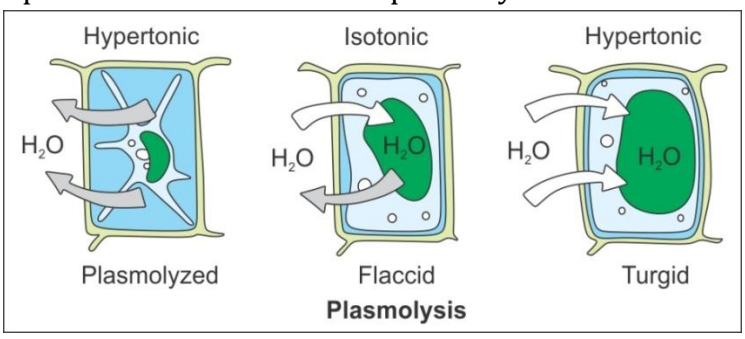
x. The electrons from cytochrome c are then transferred to O_2 via cyt a and cyt a_3.



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.

26.

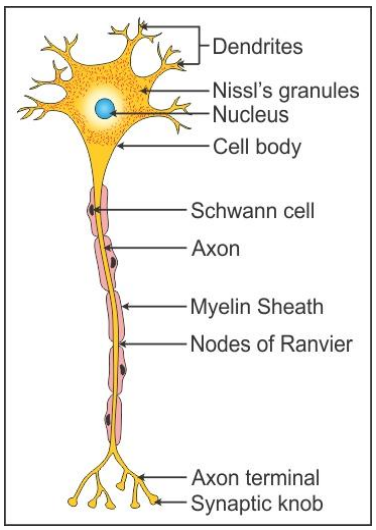
(a) In each cerebral hemisphere, the cerebral cortex contains three types of functional areas:

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

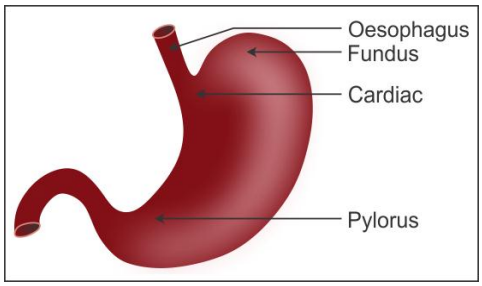
(a) The large intestine whose diameter is larger than that of the small intestine is about 1.5 metres long and divisible into three parts:

i. 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.

ii. Colon: The colon is divided into three parts—ascending, transverse and descending. The descending part opens into the rectum through the sigmoid colon.

iii. 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.

27. Formed elements in the blood include erythrocytes, leucocytes and thrombocytes.

(a) Erythrocytes:

- Haemoglobin present in the erythrocytes transport oxygen and carbon dioxide.

(b) Leucocytes:

- Lymphocytes present in the leucocytes are involved in the immune response of the body.
- Neutrophils and monocytes are phagocytic in nature. They destroy any foreign organism and provide protection against infection.
- Basophils are involved in inflammatory reactions.
- Eosinophils are associated with allergic reactions.

(c) Thrombocytes:

- They are involved in the coagulation of blood during an injury and thus prevents excess loss of blood.

OR

Process of digestion of carbohydrates in the human alimentary canal:

- Digestion of carbohydrates begins in the mouth.
- 30% of the starch is hydrolysed into maltose by the enzyme salivary amylase.
- The action of salivary amylase is inhibited by the hydrochloric acid present in the stomach.
- Digestion of starch continues in the intestine; the remaining 70% of the starch is hydrolysed by pancreatic amylase into maltose.
- Maltose and other sugars are digested by the enzymes called disaccharides of the intestinal juice (succus entericus).
- Sucrose is acted upon by sucrase and broken into one molecule of glucose and one molecule of fructose.
- Maltose is hydrolysed by maltase into two molecules of glucose.
- Lactase acts upon the milk sugar lactose and breaks it into one molecule of glucose and one molecule of galactose.
- The final products of carbohydrate digestion are monosaccharides like glucose, fructose and galactose.