

**CBSE**  
**Class XI Biology**  
**Sample Paper – 5**

**Time: 3 hrs**

**Total marks: 70**

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**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.
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**SECTION A**

1. What is the grass-green colour of green algae due to? [1]
2. What is the function of the ciliated epithelium in the human body? [1]
3. What are dyads? [1]

**OR**

If a tissue has at a given time 1024 cells, then how many cycles of mitosis have the original parental single cell undergone?

4. Name the enzyme which catalyses the phosphorylation of glucose. [1]
5. Where are the taste buds located on our tongue? [1]

**OR**

Name the structure which regulates the opening of the oesophagus into the stomach.

**SECTION B**

6. Mention any four features present in animals grouped under Phylum Mollusca. [2]
7. Differentiate between the morphology of stem and root. [2]
8. What are kinetochores? What is their function? [2]

9. Describe the 9+2 pattern of organisation in the axoneme of cilia/flagella. [2]

**OR**

Give the specific scientific terms for the following:

- (a) Cluster of ribosomes found in the cytoplasm.
- (b) Extensive infoldings of the inner membrane of the mitochondria.
- (c) Stacks of closely packed thylakoids.
- (d) Stalked particles on the inner membrane of the mitochondria.

10. In what form do plants absorb magnesium from the soil? List any two magnesium deficiency symptoms observed in leaves. [2]

**OR**

Name four elements whose deficiency causes necrosis.

11. Why does the colour of a leaf kept in the dark frequently become yellow or pale green? Which pigment do you think is more stable? [2]

12. Mention any two economic uses of agar. [2]

### **SECTION C**

13. Angiosperms and gymnosperms are seed-producing plants. Although what we eat from Pinus plants (Chilgoza) are called dry fruits, they are not fruits. [3]

- (a) Why are fruits not formed in gymnosperms?
- (b) What are the two types of seeds found in Angiosperms with reference to the number of cotyledons? Give one example of each.
- (c) What value do we learn from these differences?

14. Differentiate between brush-bordered epithelium and ciliated epithelium. [3]

15. Mention the special features of the eye in cockroach. [3]

**OR**

Complete the following statements:

- (a) In cockroach, grinding of food particles is performed by \_\_\_\_\_.
- (b) Hindgut of cockroach is differentiated into \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
- (c) In cockroach, blood vessels open into spaces called \_\_\_\_\_.

16. How is the study of plant anatomy useful to us? [3]

17. Describe the primary structure of proteins. [3]

**18.** Write any two characteristics of the mitochondria and draw a labelled diagram of it.

**OR**

What are nuclear pores? Write their functions.

**19.** List the main differences between mitosis and meiosis. [3]

**20.** Explain the apoplastic movement of water in plants. [3]

**OR**

Describe the role played by protein pumps during active transport in plants.

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

**22.** List the three major forms in which carbon dioxide is transported in our blood. [3]

**23.** Because of some physiological reasons, the blood glucose level of an otherwise normal person has shot up above normal. How will this condition be returned to normal through hormone action? [3]

**24.** Give the chemical name of one example of each of the following and mention one function of each of them: [3]

- (a) Natural auxins
- (b) Synthetic auxins
- (c) Gaseous plant hormones

**OR**

'All elements that are present in a plant need not be essential for its survival'. Comment.

#### **SECTION D**

**25.** Explain why [5]

- (a) Exogenous application of auxin fails to enhance the growth of intact plants.
- (b) Vitamins are not considered plant growth hormones.
- (c) It is appropriate to call a short-day plant a long-night plant.
- (d) Plants belonging to halophytes and growing in marshy lands face great difficulty in germination.
- (e) Gibberellins do not enhance the growth of isolated plant parts.

**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.** Briefly describe the structure of the eye with the help of a diagram.

[5]

**OR**

- i. What is meant by double circulation? Illustrate with the help of a diagram.
- ii. What is its significance?

**27.** How does the butter in your food get digested and absorbed in the body?

**OR**

An Rh-negative woman is carrying an Rh-positive foetus for the second time. Describe the consequences of Rh-incompatibility in this case.

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**Class XI Biology**  
**Sample Paper – 5 Solution**

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**SECTION A**

1. It is due to the predominance of the pigments chlorophyll a and b.
2. The function of cilia in ciliated epithelium is to maintain the flow of mucus or liquid or suspended particles constantly in one direction.
3. Dyads are the two cells formed after meiosis I.

**OR**

$2^n$  is the formula for cell division which can be used to find the value of n.

$$1024 = 2^n$$

n = No. of cycles

$$1024 = 2^{10} = 2^n \rightarrow n = 10$$

Thus, 10 cycles of mitosis are there in the original parental single cell.

4. Hexokinase
5. Taste buds are located in the papillae on the upper surface of the tongue.

**OR**

Gastro-oesophageal sphincter

**SECTION B**

6. Features of Phylum Mollusca:
  - i. They have an organ system level of organisation.
  - ii. The body is covered with a calcareous shell.
  - iii. Gills are meant for respiration.
  - iv. The body is divided into head, muscular foot and visceral hump.

7. Differences between the morphology of stem and root:

| <b>Stem</b>   | <b>Root</b>   |
|---|---|
| 1. It is the above-ground part of the plant.              | 1. It is the underground part of the plant.               |
| 2. It bears nodes and internodes.                         | 2. It does not bear nodes and internodes.                 |
| 3. It bears axillary and terminal buds.                   | 3. It does not bear any buds.                             |
| 4. It is generally green in colour.                       | 4. It is generally brown in colour.                       |
| 5. It is positively phototropic and negatively geotropic. | 5. It is negatively phototropic and positively geotropic. |

8. Kinetochore are small, disc-shaped structures at the surface of the centromeres.

Function of kinetochores:

- They serve as the sites of attachment of spindle fibres to the chromosomes during cell division.

9. The core of the cilia/flagella called axoneme has nine pairs of doublets of radially arranged peripheral microtubules and a pair of centrally located microtubules. Such an arrangement of axonemal microtubules is referred to as the 9+2 arrangement.

The core of the cilia/flagella has a supporting axial shaft or axoneme in which the microtubules are arranged in the 9+2 (11-stranded) arrangement. In such an arrangement, nine pairs of doublets of microtubules are arranged peripherally and a pair of microtubules is arranged centrally.

**OR**

- (a) Polyribosomes or polysomes
- (b) Cristae
- (c) Grana
- (d) Oxysomes or elementary particles

10. Magnesium is absorbed by plants in the form of  $Mg^{2+}$

The two magnesium deficiency symptoms include

- i. Interveinal chlorosis with purple anthocyanin pigmentation appearing first in older leaves.
- ii. Chlorotic areas may turn necrotic.

**OR**

Necrosis is caused by the deficiency of

- Magnesium
- Copper
- Potassium
- Calcium

11. The colour of a leaf kept in the dark frequently becomes yellow or pale green because the chlorophyll is degraded and there is no formation of chlorophyll. Carotenoid pigments are more stable.

12. Economic uses of agar:

- It is used as a culture medium to grow microbes in the laboratory.
- It is used in the preparation of ice cream and jelly.
- It is also used in the preparation of cosmetics.

## SECTION C

13.

- (a) There is no fruit formation in gymnosperms because they lack an ovary.
- (b) Seeds are
  - i. Dicotyledonous (with two cotyledons). Examples: Pea, bean
  - ii. Monocotyledonous (with one cotyledon). Example: Onion
- (c) Differences will always exist among individuals; appreciate and bear with them.

14.

| Brush-bordered Epithelium                       | Ciliated Epithelium  |
|---|--|
| i. Cells bear microvilli on their free surface. | i. Cells bear cilia on their free surface.   |
| ii. Microvilli increase the area of absorption. | ii. Cilia maintain the flow of mucus, liquid or suspended particles constantly in one direction. |
| iii. Example: Columnar epithelial cells         | iii. Examples: Cuboidal and columnar epithelial cells  |

15.

- i. Two large black-coloured, kidney-shaped, compound eyes are located on the dorsal side of the head.
- ii. Each eye is composed of a large number of visual elements called ommatidia.
- iii. Ommatidia help a cockroach to receive several images of an object. Such vision is called mosaic vision. It has more sensitivity and less resolution.

OR

- (a) In cockroach, grinding of food particles is performed by gizzard.
- (b) Hindgut of cockroach is differentiated into ileum, colon and rectum.
- (c) In cockroach, blood vessels open into spaces called sinuses.

16. The study of plant anatomy is useful in many ways:

- i. The study helps us understand the way a plant functions carrying out its routine activities such as transpiration, photosynthesis and growth and repair.
- ii. It helps botanists and agriculture scientists to understand the disease and cure for plants.
- iii. The study of plant anatomy helps in solving various problems related to taxonomy, phylogeny, food adulteration, archaeology and manufacture of various wood products.

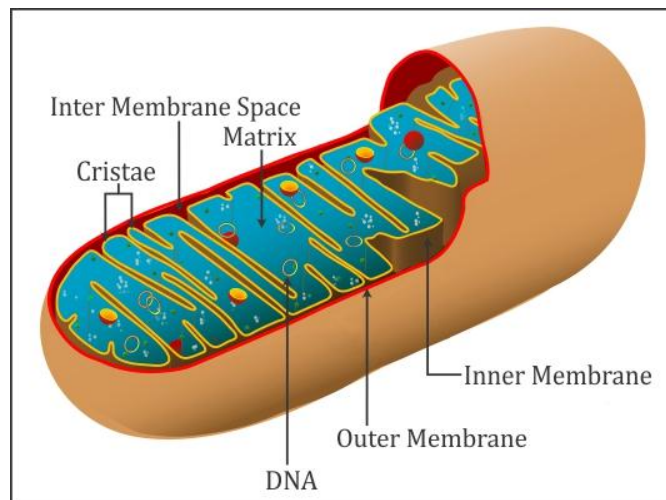
**17.** It is the description of the basic structure of a protein.

In this, the protein exists as a long chain of amino acids arranged in a particular sequence; such a polypeptide is non-functional.

The positional information of amino acids in a protein is given by the primary structure of the protein. In this chain, the amino acid at the left end is the first amino acid (usually methionine), while the one at the right end is the last amino acid of the protein. The first amino acid is called the N-terminal amino acid and the last is called the C-terminal amino acid.

**18. Characteristics:**

- (a) They are cylindrical-shaped cell organelles which have finger-like folds in the inner membrane called cristae.
- (b) Mitochondria are semi-autonomous due to the presence of their own DNA and ribosomes.



**OR**

Nuclear pores are the pores or perforations which occur at several places in the nuclear envelope.

**Functions:**

- i. They maintain the shape of the nucleus.
- ii. These nuclear pores are the passages through which movement of RNA and protein molecules takes place in both directions between the nucleus and the cytoplasm.
- iii. They preserve the stability of genetic material by protecting it from respiratory breakdown which occurs in the cytoplasm.



**19. Differences between mitosis and meiosis:**

| <b>Mitosis</b>   | <b>Meiosis</b>  |
|--|---|
| 1. Takes place in somatic cells.   | 1. Takes place in gametic cells.  |
| 2. Two daughter cells are formed.  | 2. Four daughter cells are formed.  |
| 3. The number of chromosomes remains the same in daughter cells as compared to that in parent cells. | 3. The number of chromosomes is halved in daughter cells as compared to that in parent cells. |

**20.** In apoplastic movement of water, water moves through the cell wall but does not enter the cell sap. Thus, the movement of water is continuous except at the casparian strips. This flow occurs due to adhesive and cohesive forces of water molecules. Water does not enter the cell membrane or cytoplasm during this process.

**OR**

**Role of protein pumps in active transport in plants:**

- Protein pumps are membrane proteins which make use of energy for the transport of substances across the membrane.
- These pumps form a complex with the substance to be transported using energy.
- This complex moves across the membrane, releases the substance and the pump is ready for the transport of another molecule.
- The pumps can transport substances even from lower concentration to higher concentration, i.e. against the concentration gradient.

**21.** Ubiquinone receives the electrons after its oxidation by NADH dehydrogenase (Complex I). It also receives reducing equivalents through FADH<sub>2</sub> 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.

**22.** Carbon dioxide is transported in three forms in our blood:

- i. In the dissolved form in the plasma
- ii. In the form of bicarbonates
- iii. As carbaminohaemoglobin

**23.** The secretion of glucagon will be suppressed and insulin will be secreted in response to the high glucose level in blood. It acts on hepatocytes and adipocytes, and enhances cellular glucose uptake and utilisation. As a result, there is a rapid movement of glucose from the blood to hepatocytes and adipocytes, resulting in decreased blood glucose levels (hypoglycaemia).

24.

|                            |                                 |  |
|----------------------------|---------------------------------|--|
| (a) Natural auxins         | Indole acetic acid              | <ul style="list-style-type: none"><li>• Apical dominance</li><li>• Cell division in vascular cambium</li><li>• Xylem differentiation</li></ul> |
| (b) Synthetic auxins       | 2,4-dichlorophenoxy acetic acid | <ul style="list-style-type: none"><li>• Used as a weedicide to get a weed-free lawn</li></ul>  |
| (c) Gaseous plant hormones | Ethylene                        | <ul style="list-style-type: none"><li>• Promotes ripening of fruits and root growth</li><li>• Promotes formation of root hairs</li></ul>       |

**OR**

Elements with the following features only are essential for survival:

- The element must be absolutely essential for normal growth and development. In the absence of the element, the plant will not be able to complete its life cycle.
- The requirement of the element must be specific and not replaceable by any other element.
- The element must be directly involved in the metabolism of the plant.

#### **SECTION D**

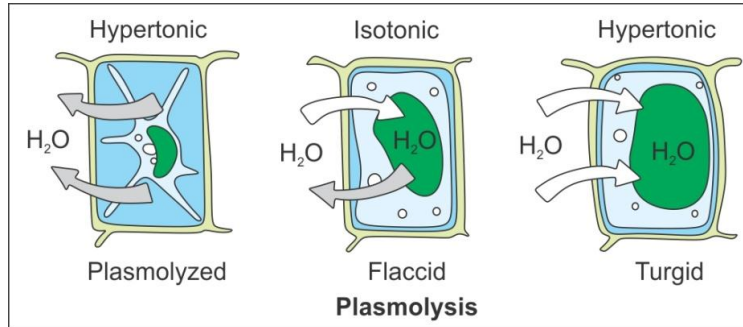
25.

- (a) Auxin fails to cause growth of intact plants because the required amount of auxin is already present in such plants and they do not need an external supply of auxins.
- (b) Vitamins have no specific influence on the growth of plants. They are essential dietary factors needed by an organism in small amounts. They influence the growth and metabolism through direct nutritive effects.
- (c) Short-day plants need a long and uninterrupted dark period for flowering. Therefore, it is appropriate to call a short-day plant a long-night plant.
- (d) Plants belonging to halophytes and growing in marshy lands face difficulty in seed germination due to the presence of a high concentration of salt in water. These plants solve this problem by vivipary.
- (e) Gibberellins require the presence of meristematic cells to cause elongation growth. Therefore, they do not enhance the growth of isolated plant parts if meristematic cells are absent.

**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. Structure of eye:** The human eye is a hollow, spherical structure. Its wall consists of three coats—the outer fibrous coat, the middle vascular coat and the inner nervous coat.

i. Fibrous coat: It consists of sclera and cornea.

(a) Sclera covers most of the eye ball and contains many collagen fibres. It protects and maintains the shape of the eye ball.

(b) Cornea is a transparent portion which forms the anterior one-sixth of the eyeball. It is vascular and absorbs oxygen from the air.

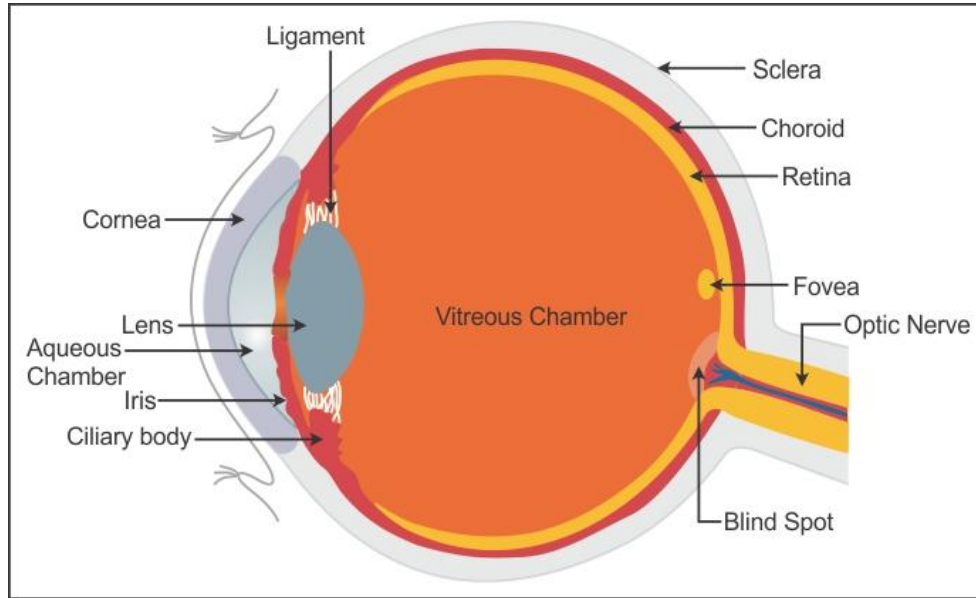
ii. Vascular coat: It comprises the choroid, the ciliary body and the iris.

(a) The choroid lies adjacent to the sclera and contains numerous blood vessels which supply nutrients and oxygen to the other tissues, especially retina. It also contains pigmented cells which absorb light.

(b) The ciliary body extends towards the inner side of the eye from the choroid coat. It is composed of ciliary muscles and ciliary processes. The ciliary processes secrete aqueous humour. The ciliary muscles are smooth muscles and are of two types—circular and meridional.

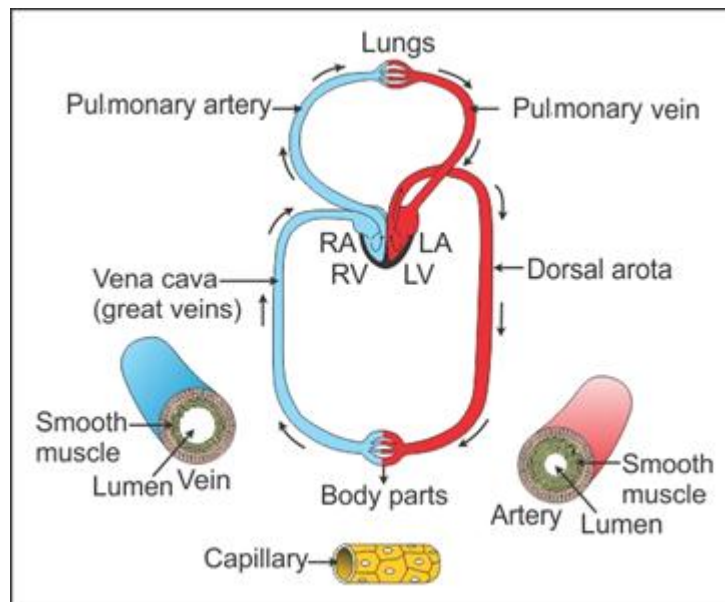
(c) The iris is a circular muscular diaphragm containing pigments which give colour to an eye. It has an opening in the centre called the pupil.

iii. Nervous coat: It consists of the retina. The retina is a very delicate coat and lines the whole of the vascular coat. Its external surface is in contact with the choroid and its inner surface with the vitreous humour. It contains three layers of cells—ganglion cells, bipolar cells and photoreceptor cells. There are two types of photoreceptor cells—rods and cones. Rods contain the pigment rhodopsin and cones contain the pigment iodopsin. Rods are sensitive to dim light, whereas cones are sensitive to bright light. Colours can be seen with the help of cone cells. A small, yellowish area of the retina which lies exactly opposite to the centre of the cornea is called macula lutea or yellow spot. It has a depression at its centre called fovea centralis which has cone cells only. The point on the retina from where the optic nerves starts is called the blind spot. It lacks receptor cells and is insensitive to light.



**OR**

- i. A circulatory system in which blood travels twice through the heart in one complete cycle of the body is called double circulation. It includes systemic and pulmonary circulation. The flow of blood from the heart to all the parts of the body and deoxygenated blood from the various parts of the body to the heart is called systemic circulation. The flow of deoxygenated blood from the heart to the lungs and the return of oxygenated blood from the lungs to the heart is called pulmonary circulation.



- ii. Significance of double circulation:
  - (a) It prevents mixing of oxygenated and deoxygenated blood.
  - (b) There is optimum utilisation of oxygen because of this type of system.

27.

- Digestion of fats is facilitated by bile salts which break down the larger fat globules into smaller ones by emulsification and thereby increase the surface area for lipase action.
- Lipase, being water soluble, acts on the surface of fat droplets which is adjoining water.
- Pancreatic lipase acts on triglycerides and gradually converts them to diglycerides and then to monoglycerides, releasing one molecule of fatty acid at every step.
- Intestinal lipase acts on absorbed diglycerides and triglycerides and breaks them into monoglycerides, fatty acids and glycerol.
- End products of fat digestion are glycerol, fatty acids and monoglycerides.
- These end products of fat digestion are incorporated into small, spherical, water-soluble molecules called micelles with the help of bile salts and phospholipids.
- Micelles are absorbed into the intestine from where fatty acids, fat-soluble vitamins and glycerol are separated.

**OR**

- Rh-antigen is present on the surface of erythrocytes in about 80–85% of human beings.
- Individuals who possess this antigen are called Rh-positive and those who do not are called Rh-negative.
- An Rh-negative person, when exposed to Rh-positive blood, develops anti-Rh-antibodies.
- A pregnant woman who is Rh-negative and bears an Rh-positive foetus will develop anti-Rh-antibodies during the first delivery, when the foetal blood comes in contact with her blood.
- These antibodies linger in the blood for sufficiently longer periods.
- If she carries a second Rh-positive foetus, the anti-Rh-antibodies in her blood enter foetal circulation and cause damage to foetal RBCs which could become fatal.
- This condition is called erythroblastosis foetalis.