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. Define cladistics. [1]

2. What is the main function of sepals? [1]

3. Can there be mitosis without DNA replication in the 'S' phase? [1]

4. What does the half-leaf experiment on photosynthesis indicate? [1]

5. What does the H-zone of a sarcomere in a myofibril contain? [1]

SECTION B

6. What are gemmae? What role does it play in reproduction? [2]

7. Explain a competitive inhibitor with a suitable example. [2]

OR

What are fatty acids? Give two examples indicating the number of carbon atoms present in each.

8. What is meant by vital capacity? List any two categories of people who possess higher vital capacity. [2]

9. Where are the myelinated and non-myelinated fibres commonly found in the nervous system? [2]

SECTION C

10. What steps would you follow to classify a specimen? [3]

11. Describe the structure and functions of the tracheary elements. [3]

12. [3]

(a) How is a pinnately compound leaf different from a palmately compound leaf?

(b) The transverse section of a plant material shows the following anatomical features –

i. The vascular bundles are conjoint, scattered and surrounded by a sclerenchymatous bundle sheath.

ii. Phloem parenchyma is absent.

What will you identify it as?

13. Explain with suitable examples the different types of phyllotaxy. [3]

OR

Draw a labelled diagram of the alimentary canal of a cockroach.

14. [3]

(a) What is meant by the dynamic state of body constituents?

(b) Name the form of energy which is used by living cells.

(c) What is an apoenzyme?

15. Write any two characteristics of mitochondria and draw a labelled diagram of a mitochondrion. [3]

16. What is the significance of meiosis? [3]

17. Give one chief function and one main deficiency symptom for each of the following in plants: Iron, Zinc and Phosphorus. [3]

18. Where does carboxylation take place in a C_3 plant? Explain the process? [3]

19. Why is the parathyroid hormone (PTH) considered a hypercalcemic hormone? [3]

20. Name the different types of teeth and their number in an adult human. [3]

SECTION D

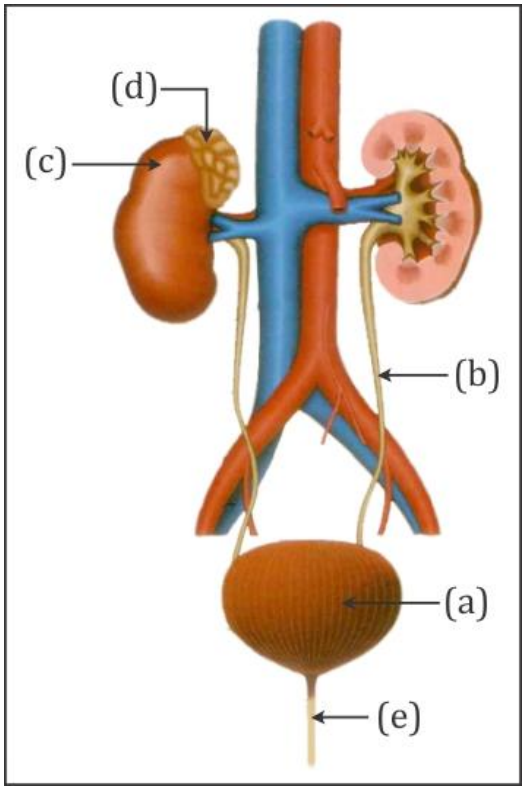
21. Read the passage and answer the questions which follow:

The Principal advised the students to grow more plants because they not only provide humans with food substances but also purify the air. Hemant asked his biology teacher to elaborate on this aspect. The teacher then explained it to him in detail. [4]

i. How can plants help in purifying the air?
ii. List conditions essential for photosynthesis.
iii. What other product, essential for survival of living organisms, is produced during photosynthesis?
iv. What is reflected in the Principal's advice to the students?

SECTION E

22. Study the given figure of the excretory system of man carefully and answer the following questions: [5]



(a) Name the parts labelled (a), (b), (c), (d) and (e).
(b) Give one major function of each of these parts.

OR

Name the components of the formed elements in the blood and mention one major function of each.

23. Explain why? [5]

(a) Exogenous application of auxin fails to enhance the growth of intact plants.

(b) Vitamins are not considered as plant growth hormones.

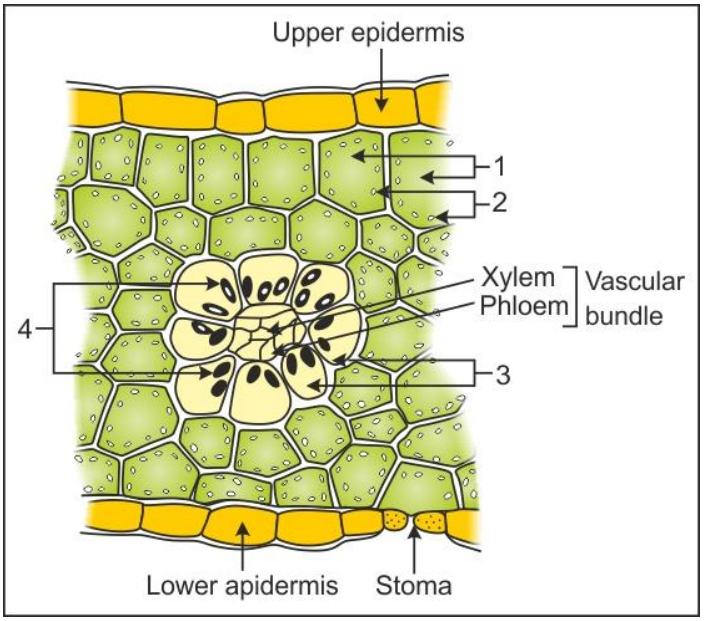
(c) It is appropriate to call a short-day plant a long-night plant.

(d) Some 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 portion of the cross-section of leaf is shown in the diagram. Answer the following:



(a) Label 1 to 4.

(b) What kind of anatomy is shown in the diagram?

(c) Write the structure and functions of 2 and 4.

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Solution

SECTION A

1. It is a system of taxonomy which arranges organisms on the basis of their shared derived characters.

2. Sepals protect the flower in the bud stage.

3. No. There cannot be mitosis without DNA replication.

4. It shows that carbon dioxide is necessary for photosynthesis.

5. The H-zone contains only myosin filaments.

SECTION B

6. Gemmae are green, multicellular, asexual buds which develop in small receptacles called gemma cups located on the thallus.
Mature gemmae separate from their stalks and get dispersed by water and animals. On germination, each gemma gives rise to a new thallus.

7. Competitive inhibitor: When the inhibitor molecules show structural similarity to the substrate molecules so that both compete to bind at the active sites of the enzyme, it is called competitive inhibitor.
Example: Malonate resembles succinate in its structure and inhibits the action of succinate dehydrogenase.

OR

Fatty acids are organic acids with hydrocarbon chains which end in a carboxylic group (–COOH). Examples: Palmitic acid has 16 carbon atoms and arachidonic acid has 20 carbon atoms.

8. It is the amount of air which one can inhale and exhale with maximum effort.
It is the sum of tidal volume, inspiratory reserve volume and expiratory reserve volume (VC = TV + ERV).
It is higher in (i) athletes and (ii) mount dwellers.

9. Myelinated nerve fibres are found in spinal and cranial nerves, while non- myelinated fibres are commonly found in autonomous and somatic neural systems.

SECTION C

10. The following features will be studied in sequence:

i. Symmetry
ii. Segmentation pattern
iii. Presence or absence of a vertebral column
iv. Locomotory organelles, i.e. limbs, fins and wings
v. Internal structures such as organ-systems, i.e. digestive, circulatory, respiratory and reproductive systems to know the level of organisation

11. The tracheids and vessels are collectively referred to as the tracheary elements.

(a) Tracheids: The tracheids are elongated dead cells with hard lignified walls, wide lumen and narrow end walls. The inner walls of tracheids have various types of thickenings for mechanical strength.

(b) Vessels: They are much elongated tubes which are closed at either end and are formed by the union of several short, wide and thickened cells called vessel elements or members.

Each cell of the vessel elements is lignified with a large cavity and devoid of protoplasm.

The end walls of vessel elements are transverse or oblique. They are often completely dissolved; the condition is called a simple perforation plate. In few cases, there are multiple perforation plates.

12.

i.

Pinnately Compound Leaf	**Palmately Compound Leaf**
i. In a pinnately compound leaf, several leaflets are present on a common axis.	i. In a palmately compound leaf, the number of leaflets is attached at the common point.
ii. The shape of the leaflets appears feather-like.	ii. The shape of the leaflets appears like a palm.
iii. The leaflet-bearing axis is the continuation of the petiole or modified mid-rib. It is prominent. Example: Neem leaves	iii. The leaflet-bearing axis is very short and represents the tip of the petiole. It is not prominent. Example: Cotton leaves

ii. It is TS of the monocot stem as the vascular bundles are scattered in monocot stems and the phloem parenchyma remains absent in it.

13. Phyllotaxy is the pattern of arrangement of leaves on the stem or branch. This is of three types—alternate, opposite and whorled.

i. Alternate arrangement of leaves: In alternate phyllotaxy, only one leaf is borne at each node. Examples: Hibiscus, mango, peepal

Alternate

ii. Opposite arrangement of leaves: In opposite phyllotaxy, a pair of leaves appear at each node and lie always opposite to each other. Examples: Tulsi, guava

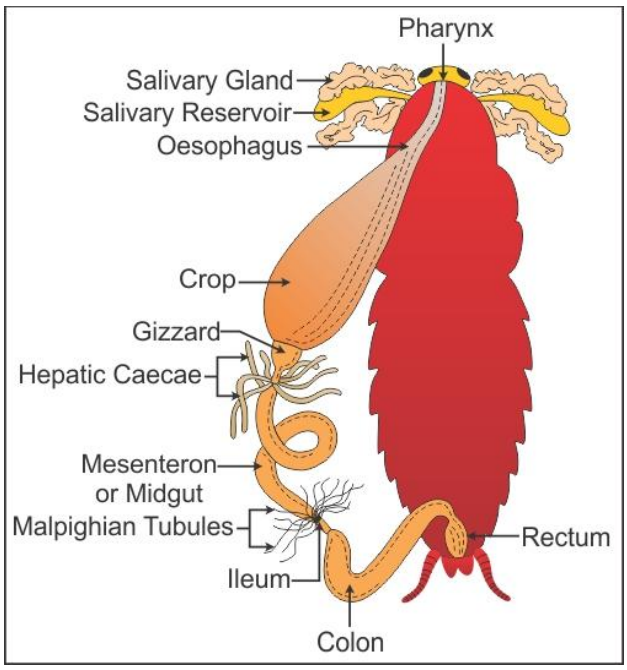
Opposite

iii. Whorled arrangement of leaves: If three or more leaves are present at a node and form a whorl, it is called the whorled arrangement of leaves. Example: Alstonia

Whorled

OR

Alimentary canal of a cockroach:

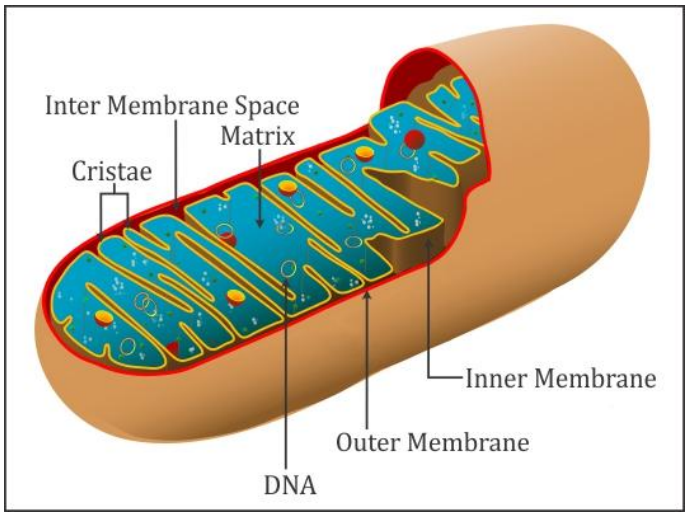


14.

i. The flow of metabolites at a definite rate and direction in the living body is known as the dynamic state of body constituents.
ii. Adenosine triphosphate (ATP)
iii. The protein moiety of a conjugate enzyme is called apoenzyme.

15. 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.



16. Significance of meiosis:

i. Formation of gametes: Meiosis produces gametes for sexual reproduction.
ii. Crossing over: It introduces a new combination of traits or variations.
iii. Maintenance of chromosome number: Meiosis reduces the number of chromosomes to half in the gametes so that fertilisation may restore the original diploid number in the zygote.

17.

i. Iron: It is an important constituent of proteins involved in the transfer of electrons such as ferredoxin and cytochromes. It is essential for the formation of chlorophyll. Its deficiency causes chlorosis.
ii. Zinc: It activates enzymes such as carboxylases, dehydrogenases and carbonic anhydrase. Its deficiency causes leaf malformations, leaf rosettes and stunted growth.
iii. Phosphorus: It is required for all phosphorylation reactions and is a constituent of the cell membrane, nucleotides, ATP and nucleic acids.
Its deficiency causes dull green leaves or purple and red spots.

18. In C_3 plants, carboxylation takes place in the stroma of the chloroplasts in mesophyll cells.

Carboxylation is the fixation of CO_2 into a stable organic intermediate. It involves two steps:

i. Six molecules of RuBP react with six molecules of CO_2 to form six molecules of transient intermediate 6C-compound. This reaction is catalysed by the enzyme RuBP carboxylase (RuBisCO).
ii. Each molecule of the 6C-intermediate breaks into two molecules of a 3C- compound, 3-phosphoglyceric acid (3 PGA).

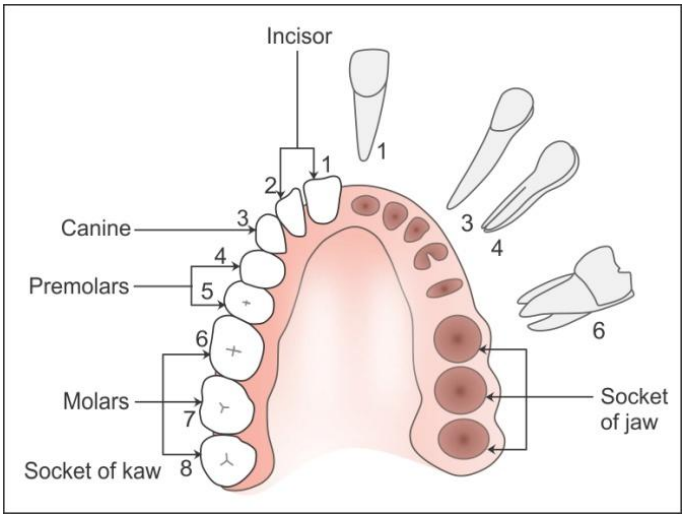
19. PTH acts on bones and stimulates the process of bone resorption (dissolution/ demineralisation); thus, it mobilises the release of calcium into the blood.

PTH also stimulates reabsorption of Ca^{2+} by the rental tubules and increases Ca^{2+} absorption from digested food.

Thus, PTH is a hypercalcemic hormone as it increases the levels of Ca^{2+} in the blood.

20. An adult human has 32 permanent teeth which are of four different types (Heterodont dentition):

Types of teeth	Number in upper jaw	Number in lower jaw
i. Incisors (I)	4	4
ii. Canine (C)	2	2
iii. Premolars (PM)	4	4
iv. Molars (M)	6	6



SECTION D

21.

i. Photosynthesis consumes atmospheric carbon dioxide which is being continuously added by the respiration of organisms and the burning of fossil fuels. Thus, plants act as purifiers of the atmosphere.

ii. Light, water, chlorophyll and carbon dioxide.

iii. They evolve oxygen during photosynthesis.

iv. It reflects his concern about the welfare of society.

SECTION E

22.

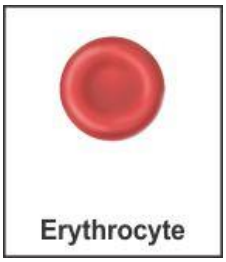
i. (a) Urinary bladder (b) Left ureter (c) Left kidney
(d) Supra renal (adrenal gland) (e) Urethra

ii. Functions of parts:
(a) It temporarily stores urine.
(b) It conducts urine from the left kidney to the urinary bladder.
(c) It forms urine by the complex of three processes—ultrafiltration, selective reabsorption and tubular secretion.
(d) It acts as an endocrine gland.
(e) It conducts urine in females and both urine and seminal fluid in males.

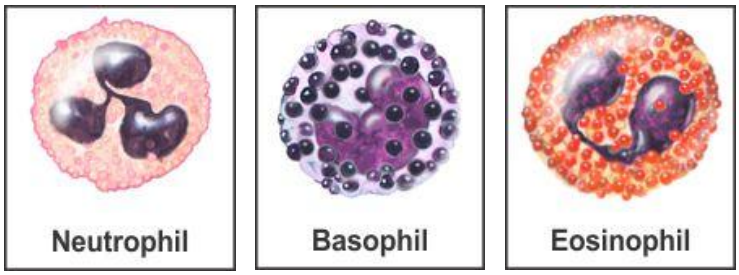
OR

Blood consists of a watery fluid called plasma in which floating bodies called formed elements are found. These formed elements are erythrocytes or red blood cells, leucocytes or white blood cells and platelets or thrombocytes.

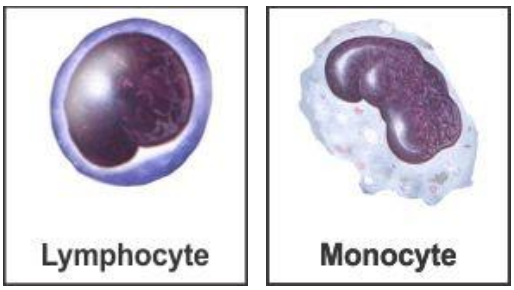
i. Erythrocytes or red blood cells: These are the most abundant cells in the human body. These are biconcave and circular, enucleated and contain the pigment called haemoglobin which imparts a red colour to the blood. They help in the exchange of gases and maintain the pH of the blood.



ii. Leucocytes or white blood cells: They are round or irregular and do not have haemoglobin. They are of two types—granulocytes and agranulocytes. Granulocytes are further divided into three types—neutrophils, eosinophils and basophils.



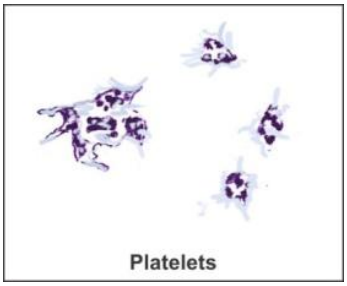
Agranulocytes are of two types—lymphocytes and monocytes.



Neutrophils and monocytes are phagocytic cells which destroy foreign organisms entering the body. Basophils are involved in inflammatory reactions and secrete histamine, serotonin and heparin. Eosinophils defend against infections. They are associated with allergic reactions.

Lymphocytes are of two major types—B and T forms. Both B and T lymphocytes are responsible for immune responses of the body.

Platelets or thrombocytes: Platelets are cell fragments and can be round or oval. They release certain chemicals called platelet factors which help in the coagulation or clotting of blood.



23.

(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 call a short-day plant a long-night plant.

(d) Plants belonging to halophytes and growing in marshy lands face a great 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

i. 1. Mesophyll cells 2. Mesophyll chloroplasts
   3. Cells of bundle sheath 4. Bundle sheath chloroplasts
ii. Kranz anatomy is shown in the given diagram. This anatomy occurs in the leaves of C_4 plants in which the bundle sheath cells are arranged in a wreath- like manner.
iii. Structure and function of mesophyll chloroplasts: Mesophyll chloroplasts are granal and contain thylakoids which are stacked to form grana. These chloroplasts are involved in the light reaction with the evolution of molecular 0_2. CO_2 is fixed by phosphoenol pyruvic acid to form 4 carbon oxaloacetic acid.

   Structure and function of bundle sheath chloroplasts: These chloroplasts are agranal, i.e. grana are absent and the thylakoids are present only as stroma lamellae. The C_3 cycle occurs in bundle sheath chloroplasts in which CO_2 is fixed by RuBP catalysed by the enzyme RuBisCO (RuBisCO is present only in bundle sheath chloroplasts). CO_2 is made available by decarboxylation of 4 carbon organic acid (malic acid).