CBSE
Class XI Biology
Sample Paper – 10

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. Define cladistics. [1]

OR

Name two botanical gardens located in India.

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]

OR

Who first showed that only the green parts of plants could release oxygen?

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

SECTION B

6. What are gemmae? What role does gemma 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]

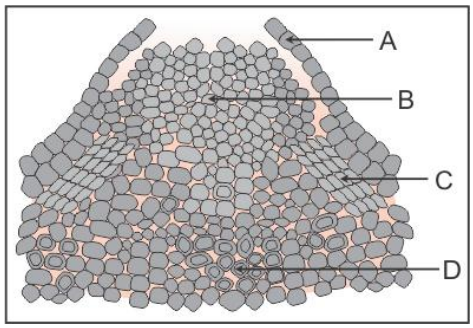
9. Where are myelinated and non-myelinated fibres commonly found in the nervous system? [2]

10. How is a key useful in the identification and classification of an organism? [2]

11. List any two points of differences between dicot stem and dicot root on the basis of their vascular bundles. [2]

OR

Below is the diagram of lenticels. Identify the regions A, B, C and D.



12. Who proposed the double helical model of DNA? Why are two strands of DNA described as antiparallel? [2]

SECTION C

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

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

OR

Understand the given description and name the cells or tissues.

(a) In dicotyledonous plants, it occurs in layers below the epidermis.

(b) Responsible for the radial conduction of water in plants.

(c) Central lumens are obliterated.

15. [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?

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

OR

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

17. [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?

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

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

20. Give one chief function and one main deficiency symptom for each of the following in plants: Iron, zinc and phosphorus. [3]

OR

Represent diagrammatically the relationship between atmospheric, soil and biomass nitrogen pools during the nitrogen cycle.

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

22. Why is the parathyroid hormone (PTH) considered a hypercalcaemic hormone? [3]

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

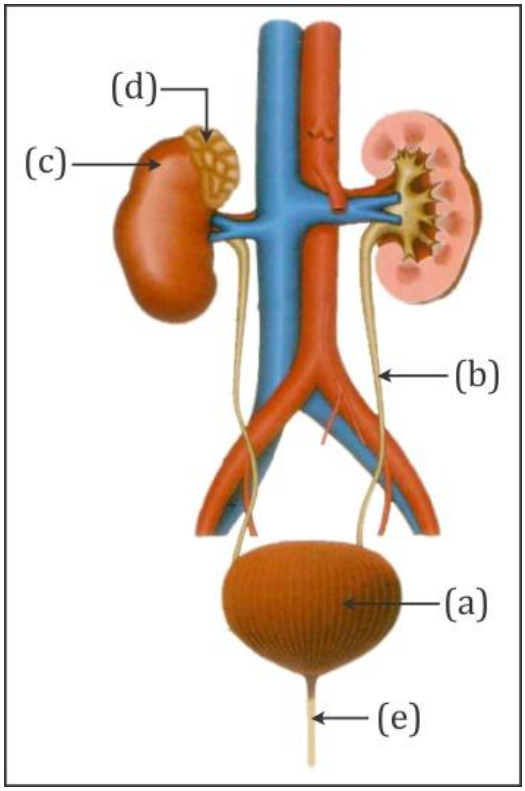
24. List any three artificial or man-made methods to overcome seed dormancy. [3]

OR

State the name of the plant growth regulator which you will use in the following cases:
(a) To promote flowering in pineapples
(b) To stimulate early seed production in conifers
(c) To sprout potato tubers
(d) To prevent leaf drop at an early age
(e) To prepare weed-free lawns
(f) To delay leaf senescence

SECTION D

25. 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.

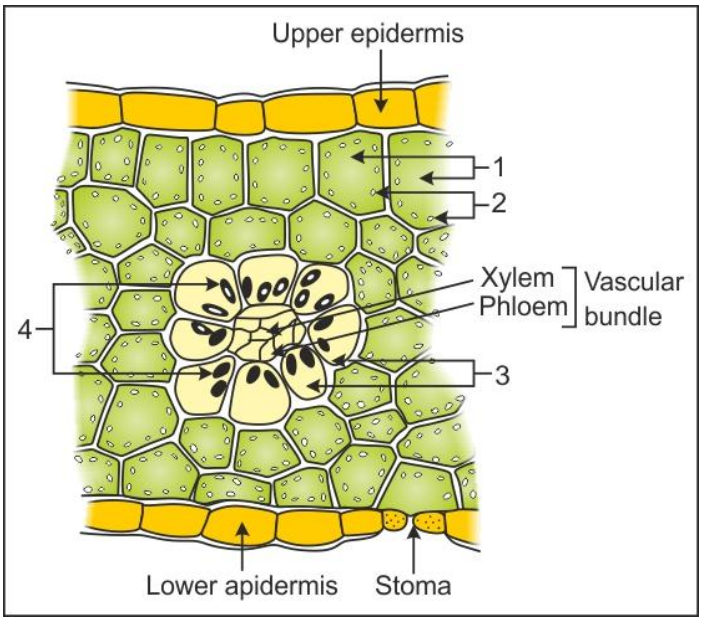
OR

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

26. 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) 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.

27. Explain diagrammatically the mechanism of breathing and the positions of ribs, diaphragms and the thoracic cavity during inspiration and expiration.

OR

What is uraemia? Name and describe the process used to remove waste substances from individuals suffering from uraemia.

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Sample Paper – 10 Solution

SECTION A

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

OR

Two botanical gardens located in India:

- National Botanical Research Institute at Lucknow
- Indian Botanical Garden at Howrah

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.

OR

Jan Ingenhousz first showed that only green parts of plants could release oxygen.

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. Vital capacity 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 + IRV).
It is higher in (i) athletes and (ii) mountain 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.

10. A key is an analytical scheme for the identification of organisms based on similarities and differences. These keys are based on similarities and dissimilarities in characters, generally in a pair called couplet. Since each couplet represents a pair of contrasting characters, there is an option to select or classify the organism into a group. Each statement in a taxonomic key is referred to as a lead. Each lead describes the characteristic of the organism, and the group into which it is classified.

11. Differences between vascular bundles in dicot stem and root:

Dicot stem vascular bundles	**Dicot root vascular bundles**
• Vascular bundles are conjoint.	• Vascular bundles are radial.
• Xylem is endarch.	• Xylem is exarch.
• Cambium is present.	• Cambium is absent.

OR

A - Epidermis
B - Complementary cells
C - Cork cambium
D - Secondary cortex

12. The double helical model of DNA was proposed by Watson and Crick. The two strands of DNA are described as antiparallel because they run in opposite directions, one in the 5' → 3' direction and the other in the 3' → 5' direction.

SECTION C

13. 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

14. 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 the 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.

OR

(a) Collenchyma

(b) Xylem parenchyma

(c) Xylem vessels

15.

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.

16. 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

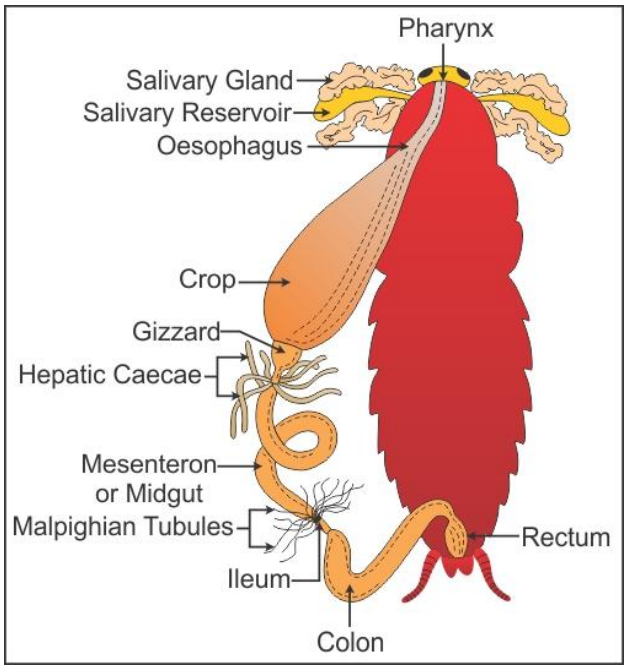
Opposite

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:



17.

i. The flow of metabolites at a definite rate and direction in the living body is known as the dynamic state of body constituents.

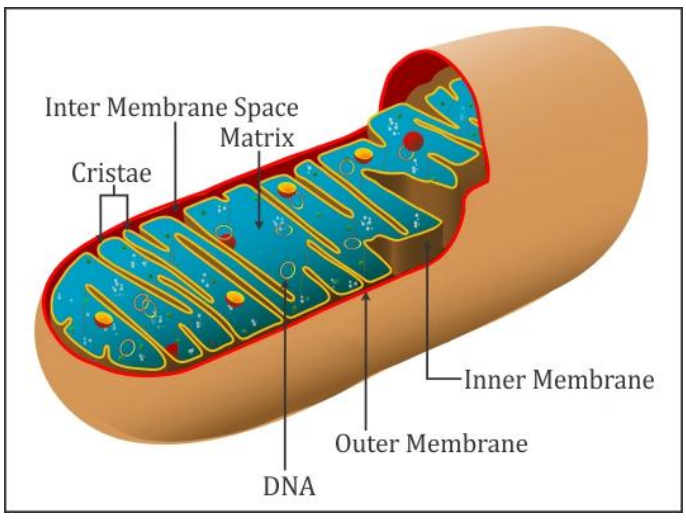
ii. Adenosine triphosphate (ATP)

iii. The protein moiety of a conjugate enzyme is called apoenzyme.

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.



19. Significance of meiosis:

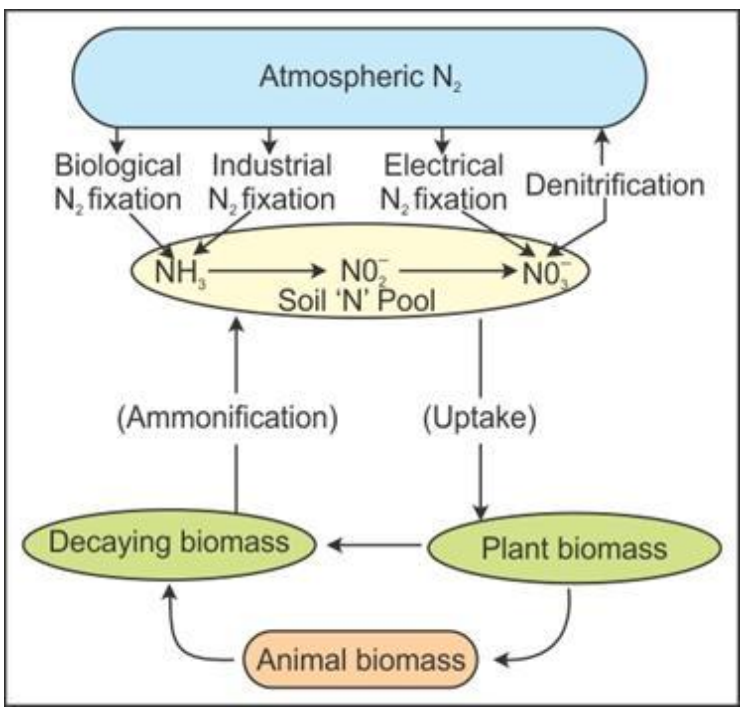
i. Formation of gametes: Meiosis produces gametes for sexual reproduction.
ii. Crossing over: It introduces a new combination of traits or variations.
iii. Maintenance of chromosome number: Meiosis reduces the number of chromosomes to half in the gametes so that fertilisation may restore the original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

20.

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.

OR

<u>Relationship between atmospheric, soil and biomass nitrogen pool during the nitrogen cycle:</u>



21. 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).

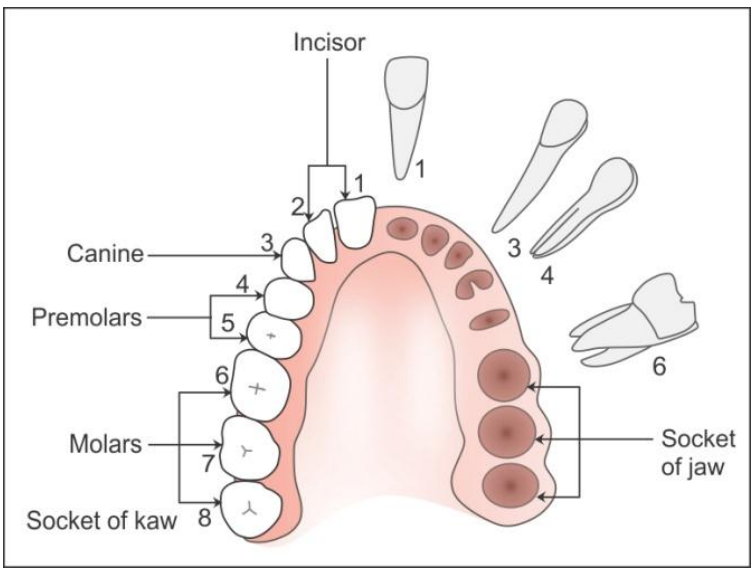
22. PTH acts on bones and stimulates the process of bone resorption (dissolution/ demineralisation); thus, it mobilises the release of calcium into the blood.

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

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

23. 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



24. Artificial methods to overcome seed dormancy:

- Abrasions are made in the seed coat mechanically using sand paper and knives.
- The seeds are subjected to chilling conditions to remove the effect of inhibitor chemicals.
- The seeds are also exposed to certain light and temperature treatment.
- The seeds are treated with gibberellic acid and nitrates to help overcome the effect of chemical inhibitors.

OR

(a) Auxins
(b) Gibberellins
(c) Ethylene
(d) Auxins
(e) Auxins
(f) Cytokinins

SECTION D

25.

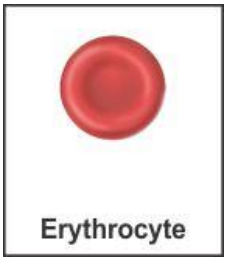
i. (a) Urinary bladder (b) Left ureter (c) Left kidney
(d) Supra renal (adrenal gland) (e) Urethra

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.

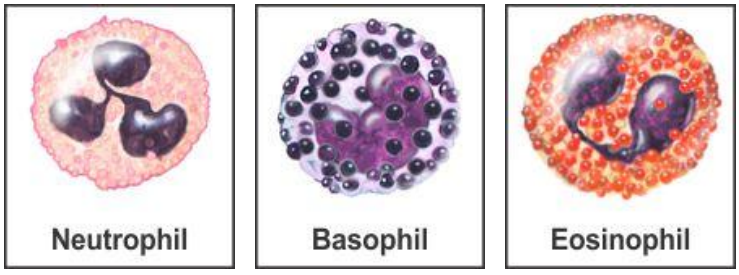
OR

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.

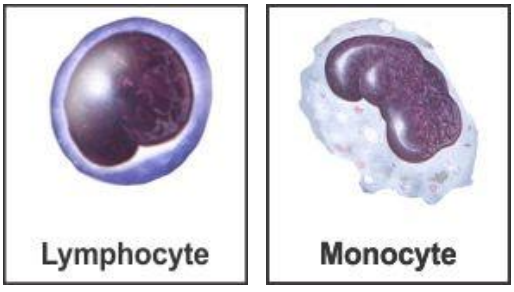
i. Erythrocytes or red blood cells: These are the most abundant cells in the human body. These are biconcave and circular, enucleated and contain the pigment called haemoglobin which imparts a red colour to the blood. They help in the exchange of gases and maintain blood pH.



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.



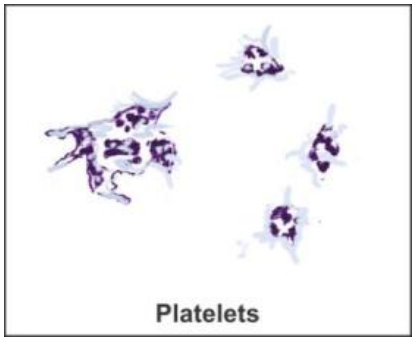
Agranulocytes are of two types—lymphocytes and monocytes.



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.

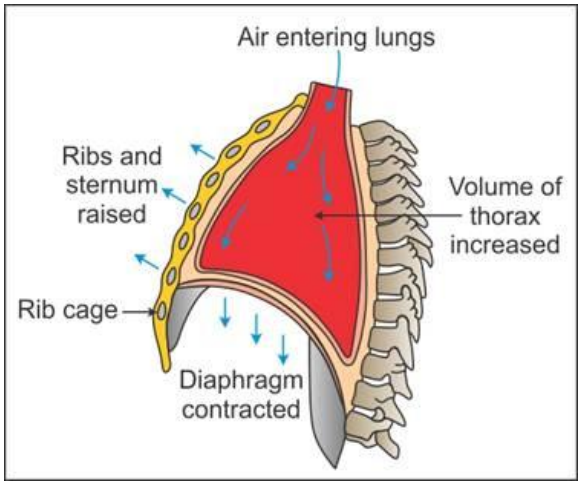


(a) Auxin fails to cause growth of intact plants because the required amount of auxin is already present in such plants and they do not need an external supply of auxins.
(b) Vitamins have no specific influence on the growth of plants. They are essential dietary factors needed by an organism in small 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 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.

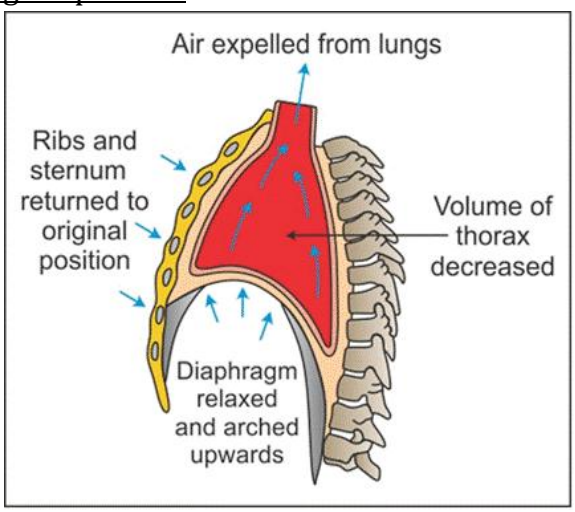
OR

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).

27. Mechanism of breathing - inspiration:



Mechanism of breathing - expiration:



OR

- Uraemia is the accumulation of urea in the blood due to malfunctioning of the kidneys.
- In individuals suffering from uraemia, the waste substances are removed by haemodialysis.
- In this process, blood is drained from the convenient artery (usually radial artery), mixed with anticoagulant such as heparin and pumped into the dialysing unit.
- The dialysing unit consists of a coiled tube surrounded by a dialysing fluid.
- The dialysing unit has the same composition as that of the plasma membrane, but it does not contain any nitrogenous waste.
- The absence of nitrogenous water in the dialysing unit enables the easy movement of waste from the urine into the tube through the porous membrane, thus clearing the blood from any waste.
- The cleared blood is then pumped back into the body through the same vein after adding anti-heparin.