

NCERT Solutions for Class-XI Biology

Chapter-6

1. State the location and function of different types of meristem.
1. Meristems are of three types on the basis of their location in plant body:
 - (i) Apical meristem: It is present at the apices of root and shoot and is responsible for increase in length.
 - (ii) Intercalary meristem: It is present at the bases of leaves above the nodes or below the nodes and is responsible for elongation of the organs.
 - (iii) Lateral meristem : It is present on lateral side and is responsible for increase in girth or diameter.
2. Cork cambium forms tissues that form the cork. Do you agree with this statement? Explain.
2. When secondary growth occurs in the dicot stem and root, the epidermal layer gets broken. There is a need to replace the outer epidermal cells for providing protection to the stem and root from infections. Therefore, the cork cambium develops from the cortical region. It is also known as phellogen and is composed of thin-walled rectangular cells. It cuts off cells toward both sides. The cells on the outer side get differentiated into the cork or phellem, while the cells on the inside give rise to the secondary cortex or phelloderm. The cork is impervious to water, but allows gaseous exchange through the lenticels. Phellogen, phellem, and phelloderm together constitute the periderm.
3. Explain the process of secondary growth in stems of woody angiosperm with help of schematic diagrams. What is the significance?
3. Secondary growth is the formation of secondary tissues from lateral meristems. It is found in dicots only. It increases the diameter of the stem. Secondary tissues are formed by two types of lateral meristems, vascular cambium and cork cambium. Vascular cambium produces secondary vascular tissues while cork cambium forms periderm. The vascular bundles in dicot stem are conjoint, collateral, open and are arranged in a ring. The cambium present between xylem and phloem in vascular bundles is called fascicular or intrafascicular cambium. Besides this, some cells of medullary rays also become meristematic and this is called interfascicular cambium. Both these cambia collectively constitute complete ring of vascular cambium. This ring of vascular cambium divides periclinally to cut off cells both on inner side and outer side. The cells cut off on outer side are secondary phloem and inner side are secondary xylem. Amount of secondary xylem cut off is more than secondary phloem and thus with the formation of secondary tissue, increase in girth or diameter occurs. The structure of secondary xylem and secondary phloem is similar to that of primary xylem and primary phloem. With the increase in secondary tissue, the primary xylem and primary phloem get crushed. The ray initials of vascular cambium ring divide by tangential divisions

and add new cells. These new cells produced on both the sides of ray initials remain meristematic for sometime and then differentiate into parenchymatous cells of rays. The rays, produced by vascular cambium in between the secondary xylem and secondary phloem, are called secondary medullary rays. They are usually one to few layers in thickness and one to several layers in height. The medullary rays form the radial system responsible for radial conduction of solutes. They maintain connection between pith and cortex. There is a marked difference in activity of cambium with change in season. In spring, the activity of cambium is more and hence the wood elements are larger in size with wide lumen. The activity of cambium is less during autumn and the wood elements are smaller in size with narrow lumen. Spring wood and autumn wood of a year constitute annual ring.

In order to increase in girth and prevent harm on the rupturing of the outer ground tissues due to the formation of secondary vascular tissues, dicot stems produce a cork cambium or phellogen in the outer cortical cells. Phellogen cells divide on both the outer side as well as the inner side to form secondary tissues. The secondary tissue formed on the inner side is called secondary cortex while the tissue formed on outer side is called cork.

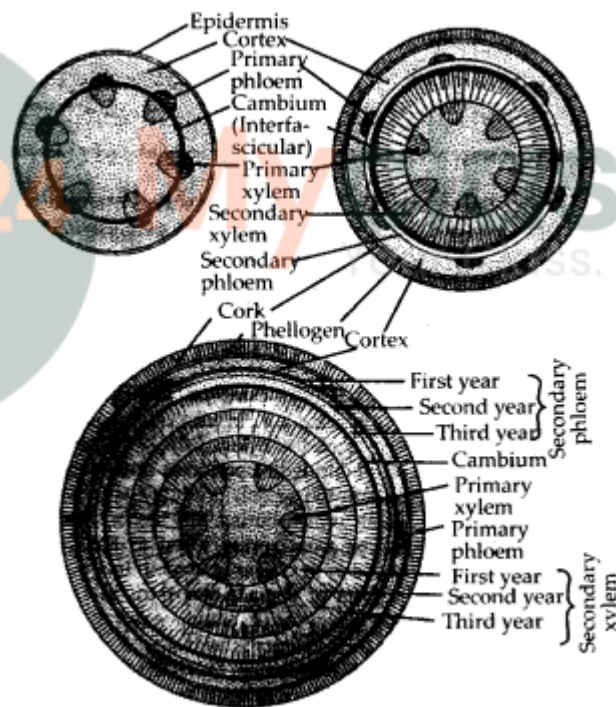


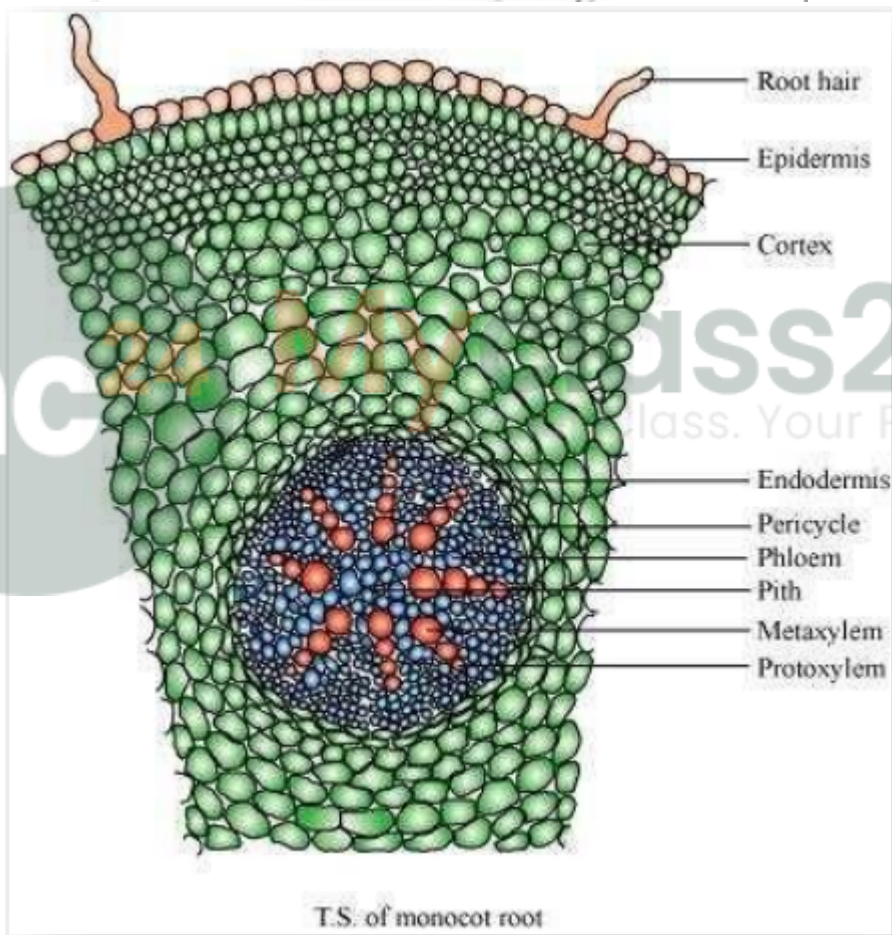
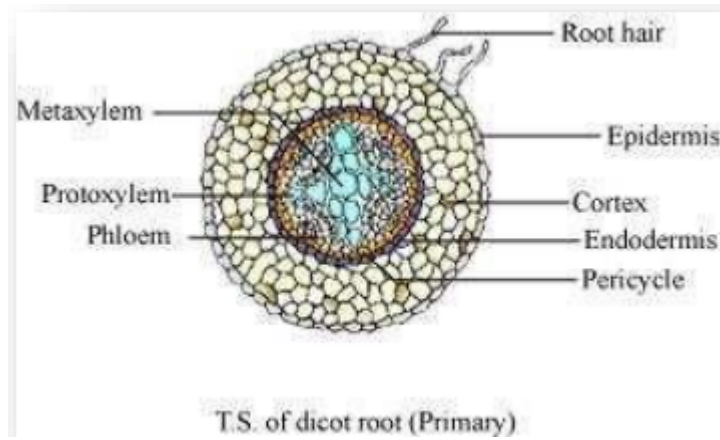
Fig.: Stages of secondary growth in a woody stem.

Significance of secondary growth is as follows:

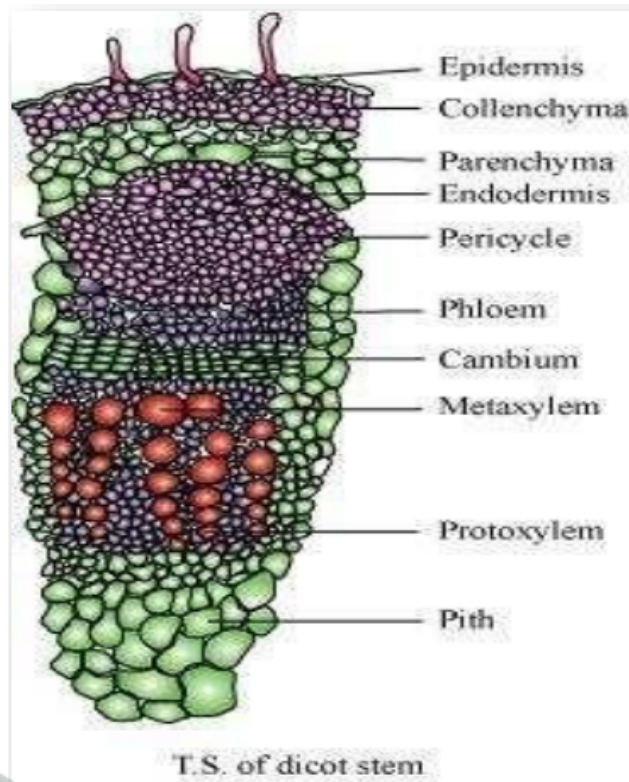
- (i) It adds to the girth of the plant thus provides support to increasing weight of aerial parts due to growth.
- (ii) It produces a corky bark around the tree trunk that protects the interior from abrasion, heat, cold and infection.
- (iii) It adds new vascular tissues for replacing old non-functioning one as well as for meeting increased demand for long distance transport of sap and organic nutrients.

4. Draw illustrations to bring out anatomical difference between

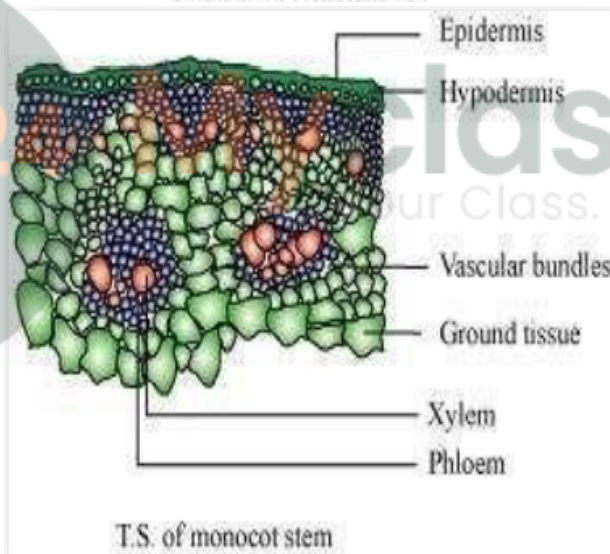
- (a) Monocot root and dicot root
- (b) Monocot stem and dicot stem
- 4. (a) Monocot root and dicot root



- (b) Monocot stem and dicot stem



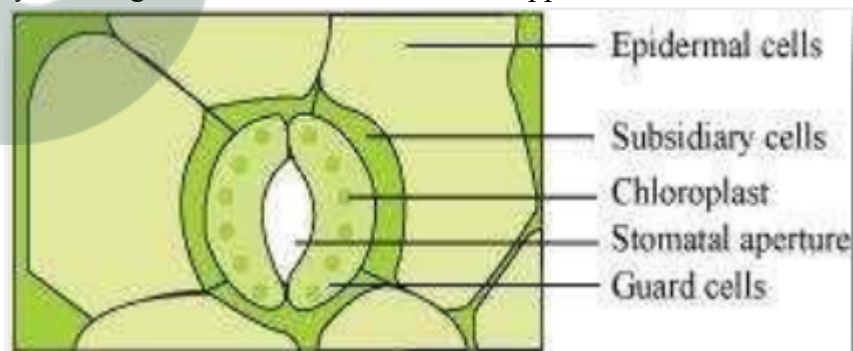
T.S. of dicot stem



T.S. of monocot stem

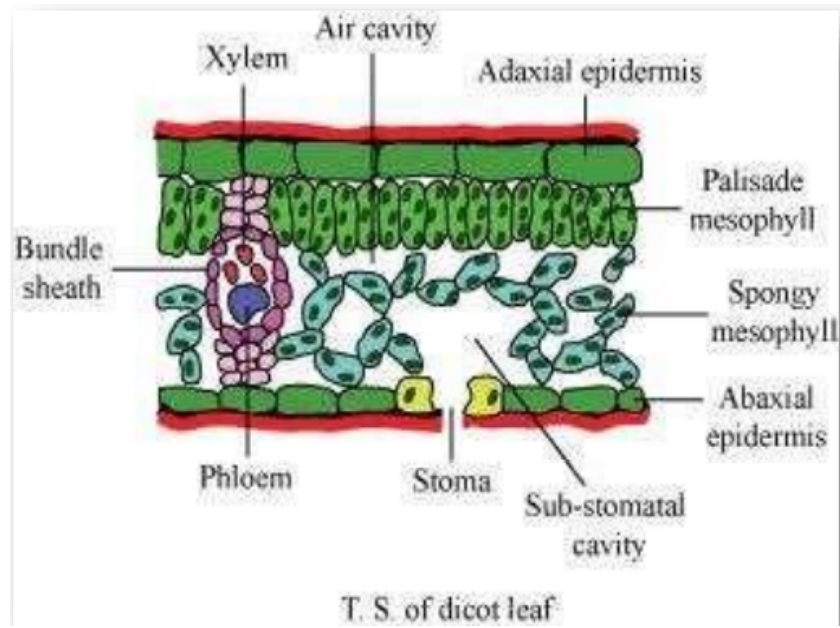
5. Cut a transverse section of young stem of a plant from your school garden and observe it under the microscope. How would you ascertain whether it is a monocot stem or dicot stem? Give reasons.
5. Vascular bundles in dicot stem are arranged in a ring whereas in monocot stem vascular bundles are scattered throughout the ground tissue. On the basis of arrangement of vascular bundles it can be ascertained whether the young stem is dicot or monocot. Besides undifferentiated ground tissue, sclerenchymatous hypodermis, oval or circular vascular bundles with Y shaped xylem are other differentiating features of monocot stem.

6. The transverse section of a plant material shows the following anatomical features, (a) the vascular bundles are conjoint, scattered and surrounded by clerenchymatous undler sheaths (b) phloem parenchyma is absent. What will you identify it as?
6. The monocot stem is characterised by conjoint, collateral, and closed vascular bundles, scattered in the ground tissue containing the parenchyma. Each vascular bundle is surrounded by sclerenchymatous bundle-sheath cells. Phloem parenchyma and medullary rays are absent in monocot stems.
7. Why are xylem and phloem called complex tissues?
7. A group of different types of cells which perform common function is called complex tissue. Xylem and phloem are called complex tissues as all cells that work as a unit for a common function have different structural organisation. Xylem has four types of cells-tracheids, vessels, xylem parenchyma and xylem fibres. Phloem consists of sieve tube elements, companion cells, phloem parenchyma and phloem fibres. Xylem is associated with conduction of water and minerals from roots to top of plants and phloem is responsible for transport of organic food.
8. What is stomatal apparatus? Explain the structure of stomata with a labelled diagram.
8. Stomata are small pores present in the epidermis of leaves. They regulate the process of transpiration and gaseous exchange. The stomatal pore is enclosed between two beanshaped guard cells. The inner walls of guard cells are thick, while the outer walls are thin. The guard cells are surrounded by subsidiary cells. These are the specialised epidermal cells present around the guard cells. The pores, the guard cells, and the subsidiary cells together constitute the stomatal apparatus.



9. Name the three basic tissue systems in the flowering plants. Give the tissue names under each system.
9. The three basic tissue systems in flowering plants are epidermal tissue system, ground tissue system and vascular tissue system.
Epidermal tissue system comprises epidermal cells, stomata, trichomes and hairs.
Ground tissue system consists of cortex, endodermis, pericycle, pith and medullary rays, in the primary roots and stems. In-leaves, the ground tissue consists of thin walled chloroplast containing cells and is called mesophyll.
The vascular tissue system consists of complex tissues, the phloem and the xylem.

- 10.** How is the study of plant anatomy useful to us?
- 10.** The study of plant anatomy helps us to understand the structural adaptations of plants with respect to diverse environmental conditions. It also helps us to distinguish between monocots, dicots, and gymnosperms. Such a study is linked to plant physiology. Hence, it helps in the improvement of food crops. The study of plant-structure allows us to predict the strength of wood. This is useful in utilising it to its potential. The study of various plant fibres such as jute, flax, etc., helps in their commercial exploitation.
- 11.** What is periderm? How does periderm formation take place in dicot stem?
- 11.** phellogen, phellogen and phellem together constitute the periderm. Periderm is protective in function. Dicot stems produce cork cambium or phellogen in the outer cortical cells. Phellogen cells divide on both the outer side as well as the inner side to form secondary tissues. The secondary tissue produced on the inner side of the phellogen is called secondary cortex or phellogen. On the outer side phellogen produces cork or phellem.
- 12.** Describe the internal structure of a dorsiventral leaf with the help of labelled diagrams.
- 12.** Dorsiventral leaves are found in dicots. The vertical section of a dorsiventral leaf contains three distinct parts.
- [1] Epidermis:
Epidermis is present on both the upper surface (adaxial epidermis) and the lower surface (abaxial epidermis). The epidermis on the outside is covered with a thick cuticle. Abaxial epidermis bears more stomata than the adaxial epidermis.
- [2] Mesophyll: Mesophyll is a tissue of the leaf present between the adaxial and abaxial epidermises. It is differentiated into the palisade parenchyma (composed of tall, compactly-placed cells) and the spongy parenchyma (comprising oval or round, loosely-arranged cells with inter cellular spaces). Mesophyll contains the chloroplasts which perform the function of photosynthesis.
- [3] Vascular system: The vascular bundles present in leaves are conjoint and closed. They are surrounded by thick layers of bundle-sheath cells.



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