6. Anatomy of flowering plants

Question 1. State the location and function of different types of meristems.

Answer: On the basis of location, meristems are of three types, apical, intercalary and lateral.

(i) Apical: It is present at the apices of stem, root and their branches. It helps in growth in length and formation of primary tissues.

(ii) Intercalary: It is found above or below stem nodes and leaf bases. It helps in growth of internodes, growth in leaves and correction of position in lodged stems.

(iii) Lateral:

(a) Phellogen (Cork cambium): It arises from the hypodermis in stems and pericycle in the roots. It helps in the formation of protective cork and aerating lenticles on the outside and secondary cortex on the inner side.

(b) Vascular cambium: In stem it is formed from intra-fascicular cambial strips and interfascicular strips. In root it develops from conjunctive parenchyma and pericycle. It helps in formation of secondary phloem on the outer side and secondary xylem on the inner side. The vascular rays are formed at the intervals for radial conduction.

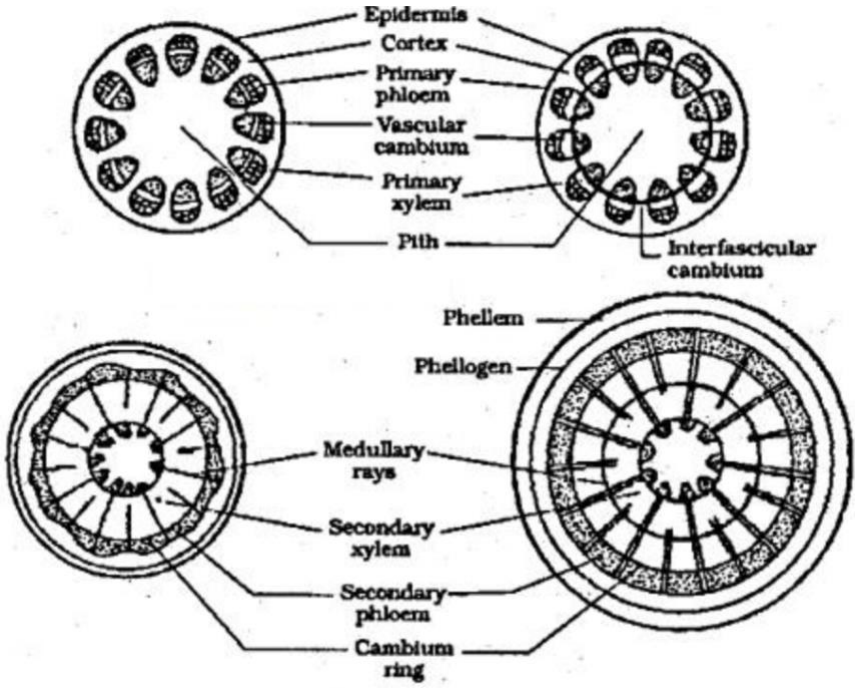
Question 2. Cork cambium forms tissues that form the cork. Do you agree with this statement? Explain.

Answer: Phellogen or cork cambium is a couple of layers thick. The layers are made up of narrow, thin-walled and nearly rectangular cells. Cork cambium cuts off cells on both sides of these the outer cells differentiate into cork or phellem while the inner cells differentiate into secondary cortex or phelloderm. The phellem and phelloderm formed from the cork cambium or phellogen are collectively known as the periderm.

Question 3. Explain the process of secondary growth in the stems of woody angiosperms with the help of schematic diagrams. What is its significance?

Answer: In woody dicots, the strip of the cambium located between the primary xylem and phloem is known as the interfascicular cambium. The cambium is formed from the cells of the medullary rays adjoining the interfascicular cambium. This results in the formation of a continuous cambium ring. The

cambium cuts off new cells toward its either sides. The cells located towards the outside differentiate into the secondary phloem, while the cells cut off toward the pith gives rise to the secondary xylem produced is more than that of the secondary phloem. The secondary growth increases the girth of plants increases the amount of water and nutrients to support the growing number of leaves and also provides support to plants.

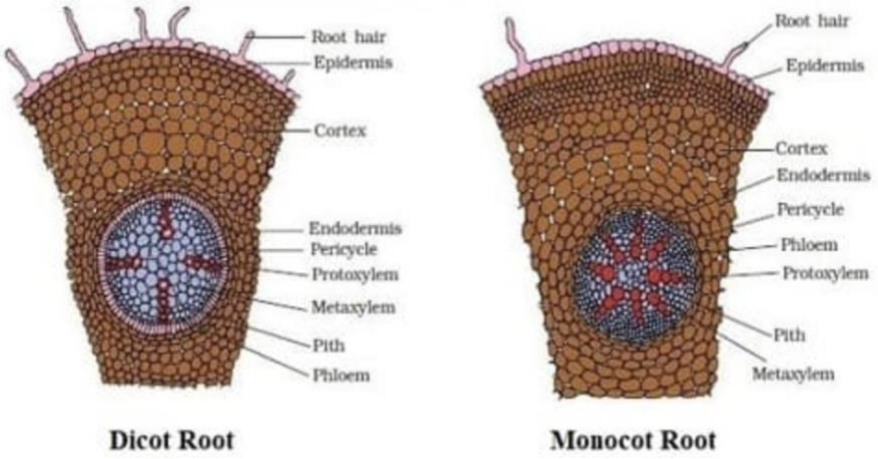


Question 4. Draw illustrations to bring out the anatomical difference between

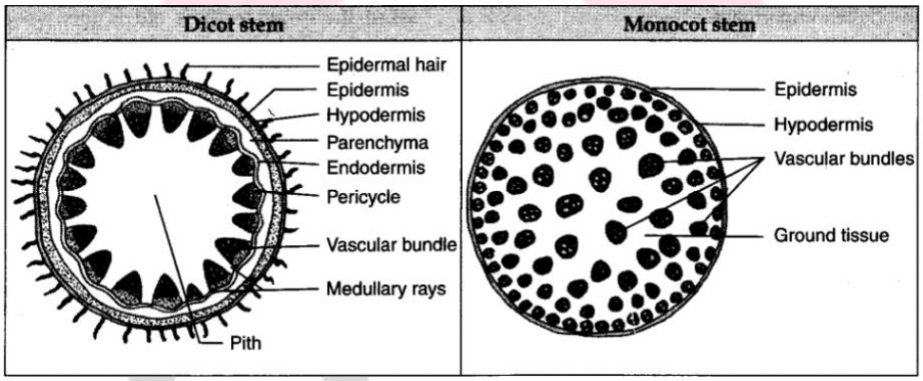
(a) Monocot root and Dicot root (b) Monocot stem and Dicot stem.

Answer:

(a) Monocot and dicot root



(b) Monocot and dicot stem



Question 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 a dicot stem? Give reasons.

Answer:

Monocot stem	Dicot stem
The scattered vascular bundle can be seen without specific pattern on the cytoplasm.	The vascular bundle can be seen with a pattern of a ring formation in the cell.

Parenchyma are present in the cortex region.	Parenchyma can be seen with half present in the pith region and half surrounded by the vascular bundle.
No pith can be seen in the slide.	Pith can be seen.
The epidermis region is large, acquiring more regions compared to the vascular region.	Epidermis covers a small area as compared to monocot.

Question 6. The transverse section of a plant material shows the following anatomical features – (a) the vascular bundles are conjoint, scattered and surrounded by a sclerenchymatous bundle sheaths. (b) phloem parenchyma is absent. What will you identify it as?

Answer: The monocot stem has conjoint, collateral and closed vascular bundles which are scattered in the ground tissue containing the parenchyma. Each vascular bundle is surrounded by sclerenchymatous bundle-sheath cells. Phloem parenchyma and medullar rays are absent in monocot stems.

Question 7. Why are xylem and phloem called complex tissues?

Answer: The Xylem and phloem are composed of more than one type of cells which work as a unit. Xylem helps in conducting water and minerals. It is made up of the following components:

A. Tracheids (xylem vessels and tracheids)

B. Xylem parenchyma

C. Xylem fibres

These cells work together in coordination and help in the storage of food materials and in the radial conduction of water. Phloem helps in conduction of food materials, composed of:

A. Sieve tube elements

B. Companion cells

C. Phloem parenchyma

D. Phloem fibres

The cells of the phloem work as a unit to conduct prepared food from the leaves to the different part of the plants.

Question 8. What is stomatal apparatus? Explain the structure of stomata with a labelled diagram.

Answer: Stomata are the small pores present in the epidermis of leaves. They regulate the process of transpiration and gaseous exchange. The stomatal pore is enclosed between two bean shaped 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.

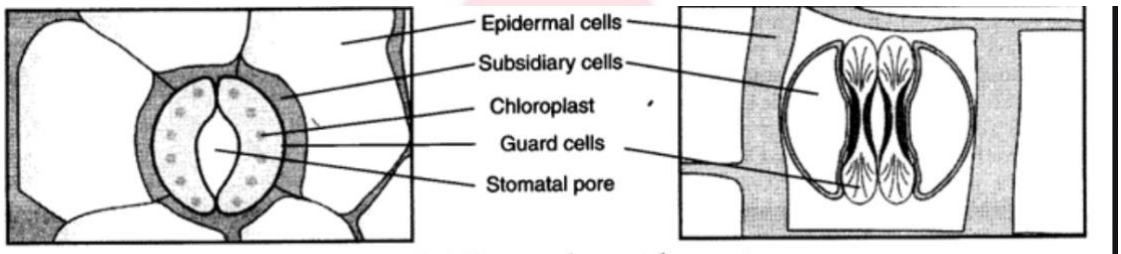


Fig. Labelled diagram of stomatal apparatus

Question 9. Name the three basic tissue systems in the flowering plants. Give the tissue names under each system.

Answer: The three basic tissue system in plants are:

(i) Epidermal tissue system: It forms the outermost covering of the whole plants body. It comprises of epidermal cells, stomata and the epidermal appendages like trichomes and hairs.

(ii) Vascular tissue system: It consists of phloem and the xylem.

(iii) Ground tissue system: All the tissues except the vascular bundles and the epidermis constitute the ground tissue system. These include parenchyma, collenchyma and sclerenchyma and mesophyll cells.

Question 10. How is the study of plant anatomy useful to us?

Answer: The study of plant anatomy helps to understand the structural adaptations of plants with respect to diverse environmental conditions. It helps us to distinguish between monocots, dicots, and gymnosperms. Such as study is linked to plant physiology. Hence, it helps in enhancement of food crops. The study of plant-structure allows us to predict the strength of wood. This is helpful in utilising it to its potential. The study of various plant fibres such as jute, flax, etc., helps in their commercial exploitation.

Question 11. What is periderm? How does periderm formation take place in the dicot stems?

Answer: Periderm refers to the collective term used to signify phellogen, phellem and phelloderm in a plant stem. Periderm formation in plants, mainly occur to replace the existing epidermis.

Formation of periderm

The formation of periderm occurs during secondary growth. During this process, to replace the broken outer epidermal layer and the cortical layer, the cells of the cortex turn meristematic. As a result of this, cork cambium or phellogen is formed. The phellogen is composed of thin-walled, narrow and rectangular cells. Later on, the phellogen cuts off cells on its either side. The cells of the outer side gives rise to the phellem or cork which due to the deposition of suberin in its cell wall is impervious to water. Similarly, the inner side forms secondary cortex or phelloderm which is mainly parenchymatous in nature.

Question 12. Describe the internal structure of a dorsiventral leaf with the help of labelled diagram.

Answer: Internal structure of a dorsiventral (dicotyledonous leaf):

(i) It shows three main parts namely epidermis, mesophyll and vascular system.

(ii) The epidermis which covers both the upper surface (adaxial epidermis) and lower epidermis (abaxial surface) are covered with thick layer of cuticle.

(iii) The tissue between the upper and lower epidermis is known as mesophyll. The tissue possess chloroplasts and carry out photosynthesis, is made up of parenchyma.

(iv) The parenchyma has two types of cells i.e., palisade parenchyma and spongy parenchyma.

(v) There are large number of air cavities in between these cells.

(vi) In the midrib region and in veins vascular bundles made up of xylem and phloem are present.

(vii) The size of the vascular bundles are dependent on the size of veins. The veins are different in thickness in the reticulate venation of dicot leaves.

(viii) The vascular bundles are surrounded by bundle sheath cells.

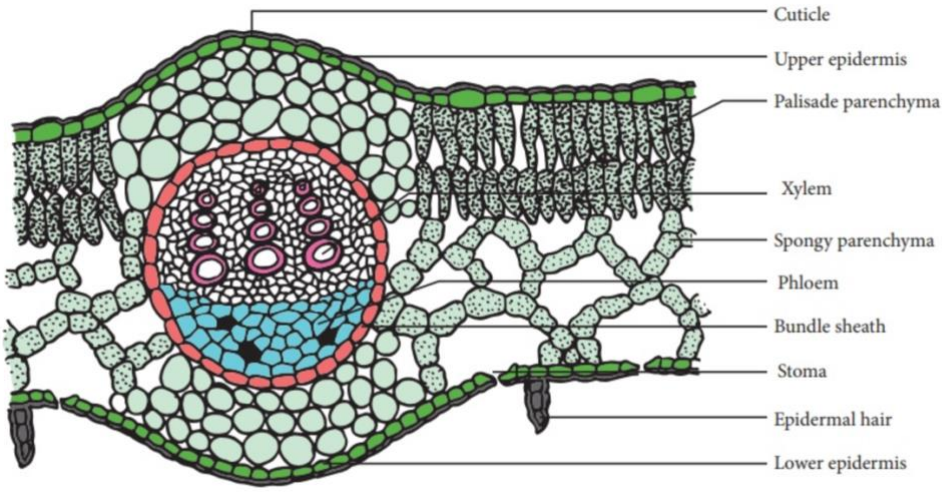


Figure 12.6 Transverse section of Dicot leaf