Chapter: Anatomy

Exercise

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

Answer: Meristems are specialized plant development zones. Meristems are the areas of the body where active cell division and fast cell division occur. Meristems are classified into three types based on their location.

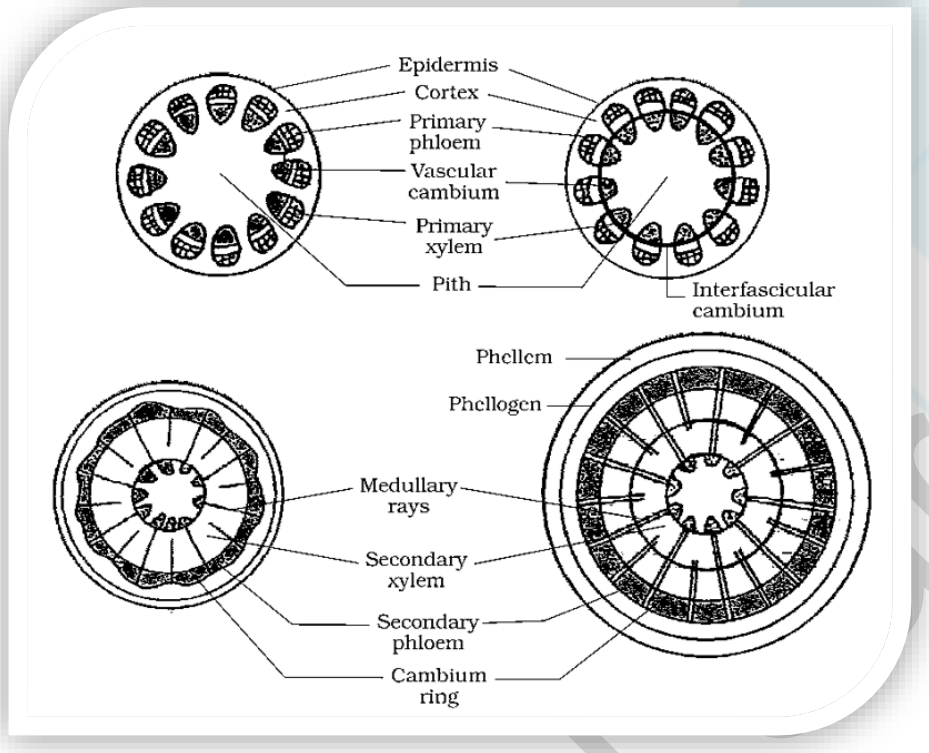
- Apical meristem: It can be found at the root and shoot apex. The shoot apical meristem is found at the terminal of the shoots, and its active division causes the stem to lengthen and new leaves to grow. Root extension is aided by the root apical meristem.
- Intercalary meristem: It can be found between the masses of mature tissues near the base of grasses' leaves. It aids in the regrowth of grasses after herbivores have grazed them. The main meristem is made up of the intercalary and apical meristems, which arise early in a plant's life.
- Lateral meristem: It's found in roots and shoots' mature tissues. The secondary meristem is named for the fact that it appears later in a plant's life. It aids in the addition of secondary tissues to the plant body as well as the expansion of plant girth. Fascicular cambium, interfascicular cambium, and cork cambium are among examples.

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

Answer: The epidermal layer of the dicot stem and root is damaged when secondary growth occurs. The outer epidermal cells must be replaced in order to provide infection protection to the stem and root. As a result, the cork cambium emerges from the cortical area. It is made up of thin-walled rectangular cells and is also known as phellogen. It separates cells on both sides. The cork or phellem is formed from the cells on the outside, while the secondary cortex or phelloderm is formed from the cells on the inside. The cork is impermeable to water, but the lenticels allow gaseous exchange. The periderm is made up of three layers: phellogen, phellem, and phelloderm.

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

Answer: The interfascicular cambium is a strip of cambium found between the primary xylem and phloem in woody dicots. The cells of the medullary rays that adjoin the interfascicular cambium create the interfascicular cambium. A continuous cambium ring is formed as a result of this process. New cells are shut off from the cambium on both sides. The cells that are present on the exterior differentiate into secondary phloem, whilst the cells that are cut off near the pith differentiate into secondary xylem. The amount of the secondary xylem produced is larger than that of the secondary phloem.



Secondary growth in plants improves plant girth, increases the quantity of water and nutrients available to support the increased number of leaves, and also offers support to the 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 root and dicot root

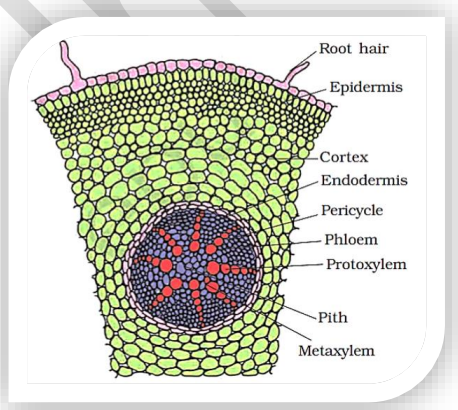


Fig. T.S of Monocot root

(b)Monocot stem and dicot stem

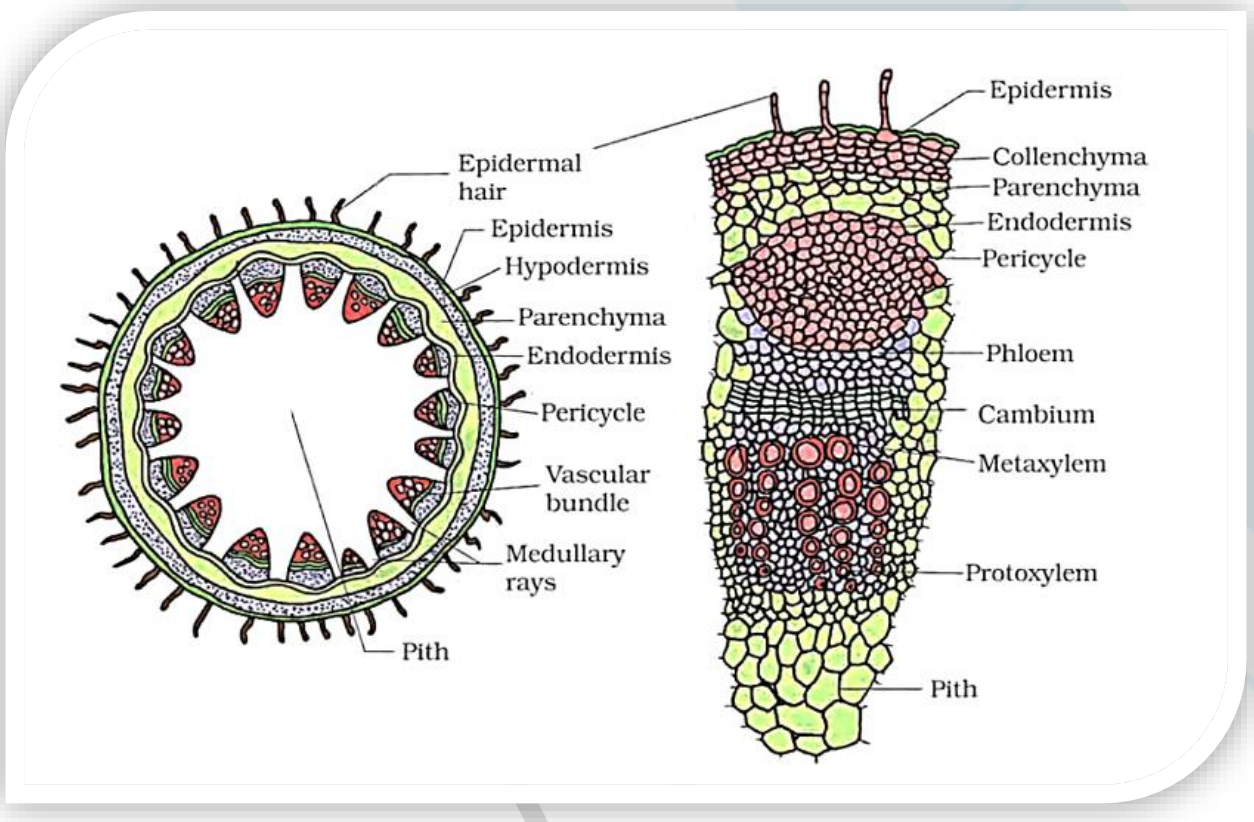


Fig. T.S. of stem Dicot

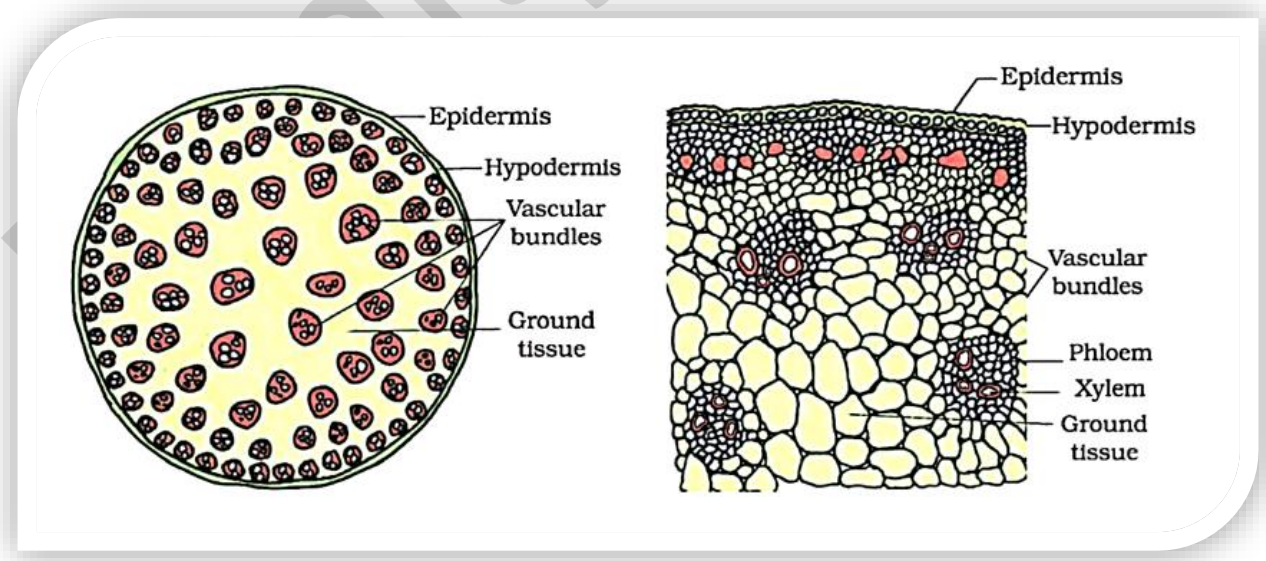


Fig. T.S. of stem Monocot

(b)Monocot stem and dicot stem

Question 5. Cut a transverse section of the 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: The presence of conjoint, collateral, and open vascular bundles, as well as a strip of cambium between the xylem and phloem, distinguishes the dicot stem. The vascular bundles form a ring around the pith, which is positioned in the centre. The collenchyma, parenchyma, endodermis, pericycle, and pith are the different types of ground tissue. Between the vascular bundles are medullary rays.

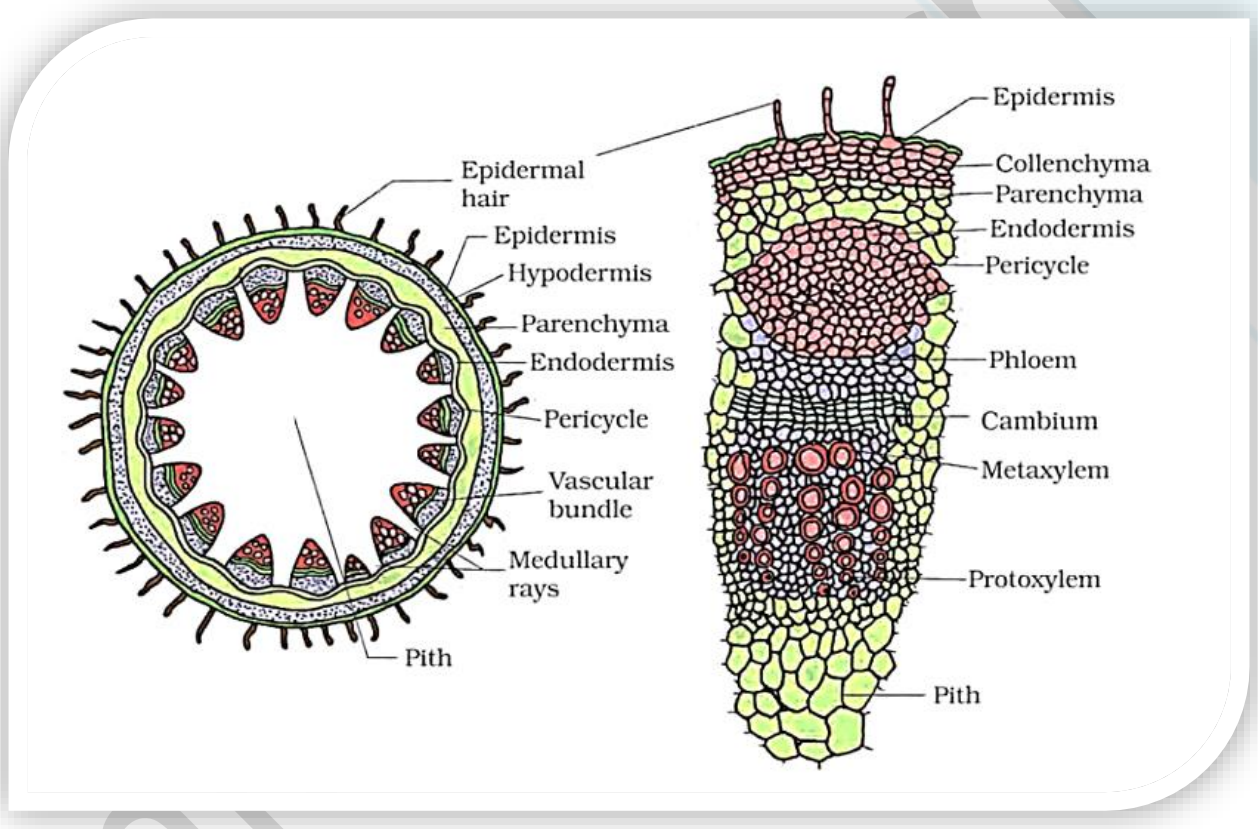


Fig. T.S. of stem Dicot

Conjoint, collateral, and closed vascular bundles are dispersed throughout the ground tissue containing the parenchyma in the monocot stem. Sclerenchymatous bundle-sheath cells surround each vascular bundle. There is no phloem parenchyma, but there are water-filled cavities.

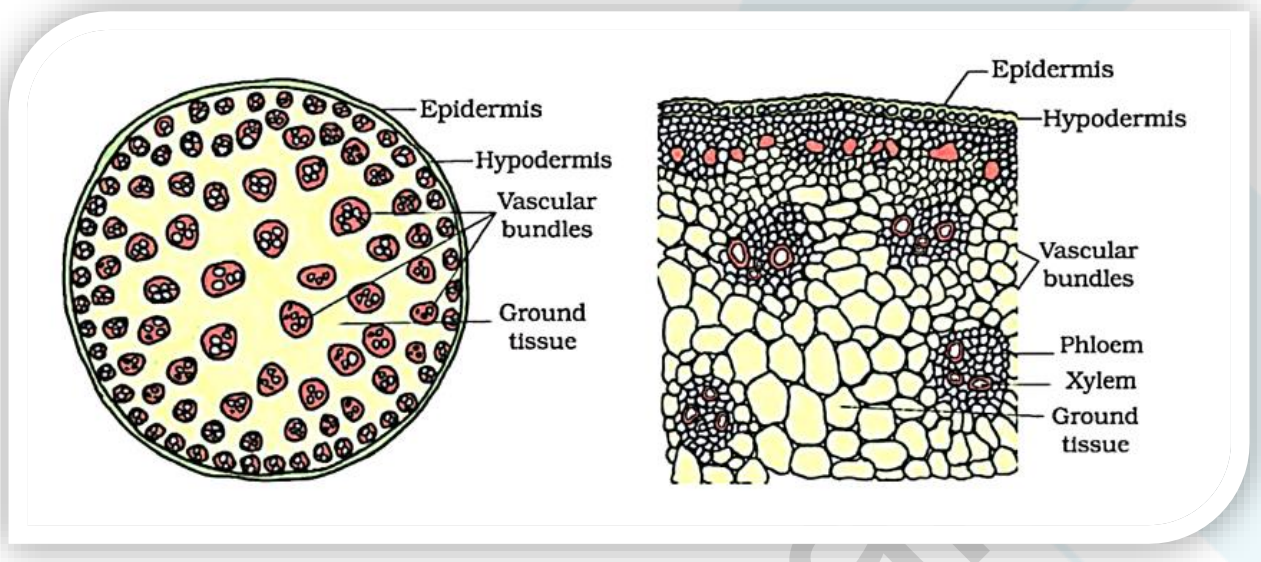


Fig. T.S. of stem Monocot

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

Answer: Conjoint, collateral, and closed vascular bundles are dispersed throughout the ground tissue containing the parenchyma in the monocot stem. Sclerenchymatous bundle-sheath cells surround each vascular bundle. Monocot stems lack phloem parenchyma and medullary rays.

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

Answer: Xylem and phloem are referred to as complex tissues since they are made up of numerous types of cells. These cells collaborate to fulfil the multiple functions of the xylem and phloem in a coordinated manner.

The transfer of water and minerals is aided by the xylem. It also provides mechanical support to plants. It is made up of the following components:

- Tracheids (xylem vessels and xylem tracheids)
- Xylem parenchyma
- Xylem fibres

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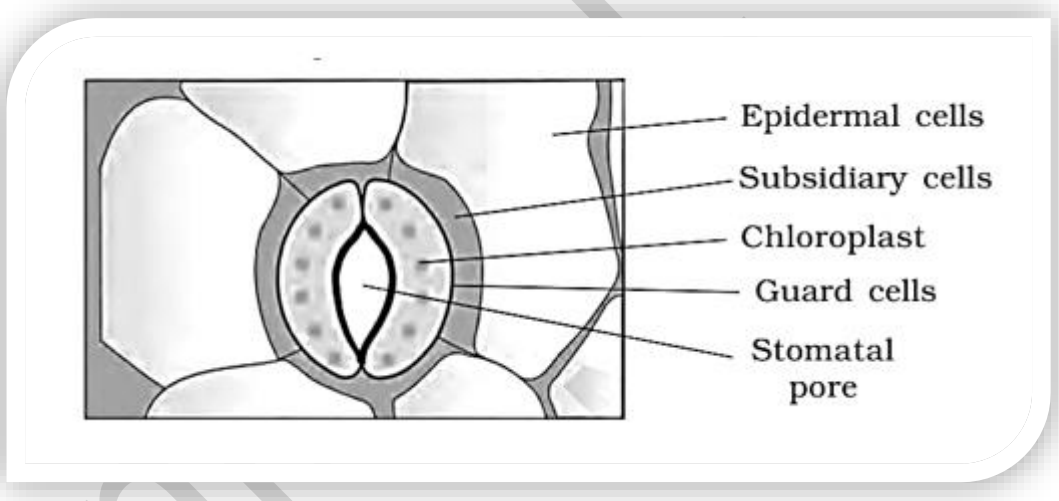
- Sieve tube elements
- Companion cells

- ¬ Phloem parenchyma
- ¬ Phloem fibres

In companion cells, sieve tube elements are elongated tube-like structures. Perforating the end walls of sieve tube elements creates the sieve plate. Sieve tube elements are living cells with cytoplasm and nucleus. Companion cells are parenchymatous in nature. They help to keep the pressure gradient in the sieve tube elements intact. Long tapering cells with a rich cytoplasm make up phloem parenchyma, which aids in food storage. Phloem fibres are sclerenchymatous cells with thick cell walls.

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

Answer: Sieve tube elements are elongated tube-like structures seen in companion cells. The sieve plate is formed by perforating the end walls of sieve tube elements. Living cells with cytoplasm and nuclei make up sieve tube elements. In nature, companion cells are parenchymatous. They contribute to the preservation of the pressure gradient in the sieve tube elements. Phloem parenchyma is made up of long tapering cells with a rich cytoplasm that aids in food storage. Elongated sclerenchymatous cells with thick cell walls make up phloem fibres.



Question 9. Name the three basic tissue systems in the flowering plants. Give the tissue names under each system. How is the study of plant anatomy useful to us?

Answer:

	Tissue system	Tissues present
1	Epidermal tissue system	Epidermis, trichomes, hairs, stomata
2	Ground tissue system	Parenchyma, collenchyma, sclerenchyma, mesophyll
3	Vascular tissue system	Xylem, phloem, cambium

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

Answer: The study of plant anatomy aids in our understanding of plant structural adaptations to a variety of environmental situations. It also aids in the differentiation of monocots, dicots, and gymnosperms. A study like this is related to plant physiology. As a result, it aids in the enhancement of food crops. We can forecast the strength of wood by studying plant structure. This helps realise its full potential. The study of plant fibres such as jute, flax, and others aids in their commercialization.

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

Answer: The phellogen, phellem, and phelloderm make up the periderm. The cambium breaks the outer epidermal layer and the cortical layer during secondary growth. The cortex's cells become meristematic to replace them, giving rise to cork cambium or phellogen. It is made up of cells with thin walls, narrow dimensions, and a rectangular shape. Phellogen severs the cells on each side of it. The phellem, or cork, is made up of cells that have been chopped off toward the outer. Its cell wall is impermeable to water due to suberin deposits. The secondary cortex, or phelloderm, develops from the inner cells. The secondary cortex is made up of parenchymatous cells.

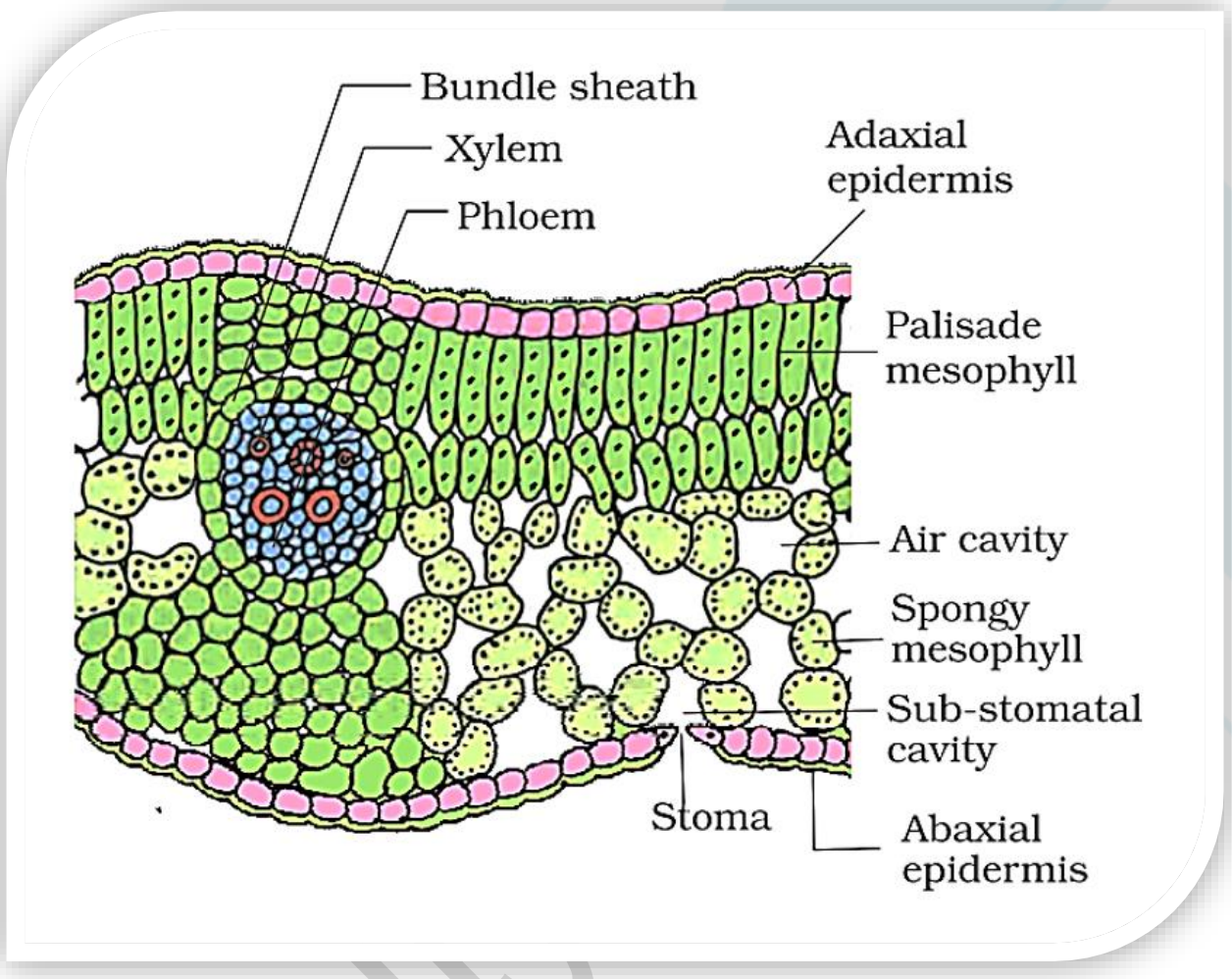
Question 12. Describe the internal structure of a dorsiventral leaf with the help of labelled diagrams.

Answer: In dicots, dorsiventral leaves are found. A dorsiventral leaf's vertical segment is divided into three sections.

1. Epidermis: Epidermis is found on both the upper (adaxial epidermis) and lower surfaces of the skin (abaxial epidermis). A thick cuticle covers the epidermis on the exterior. More stomata are found in the abaxial epidermis than in the adaxial epidermis.

2. Mesophyll: Mesophyll is a leaf tissue located between the adaxial and abaxial epidermis. It is divided into two types: palisade parenchyma (which is made up of tall, densely packed cells) and spongy parenchyma (which is made up of oval or round, loosely organised cells with intercellular spaces). The mesophyll is made up of chloroplasts, which are responsible for photosynthesis.

3. Vascular system: In leaves, the vascular bundles are joined and closed. They're surrounded by bundle-sheath cells in dense layers.


Bundle sheath
Xylem
Phloem
Adaxial epidermis
Palisade mesophyll
Air cavity
Spongy mesophyll
Sub-stomatal cavity
Stoma
Abaxial epidermis