5.3 : Plant tussues :

Q.101. Define the following:

i. Tissue

Ans: A group of cells having a common origin and performing similar function or a set of similar functions is called tissue.

ii. Meristematic tissue:

Ans: A tissue which consists of dividing cells or the. cells having power of cell division IS called meristematic tissue.

iii. Simple tissues

Ans: A group of similar cells that perform a common function and have common origin are called simple tissues.

iv. Complex tissues

Ans: Complex tissues are the tissues with two or more cell types.

v. Permanent tissues

Ans: Tissues that develop from meristems and differentiate for specific functions are called permanent tissues.

vi. Aerenchyma

Ans: Parenchyma with many air spaces is called aerenchyma.

vii. Primary xylem

Ans: Xylem derived from meristem is called the primary xylem.

viii. Secondary xylem

Ans: Xylem derived from vascular cambium is called the secondary xylem.

Q.102. Give the characteristics of meristematic tissues.

OR

Enlist the characteristics of meristematic tissues.

Ans: Characteristics of meristematic tissues:

i. The cells of meristematic tissue are living and possess the power of division.
ii. Each cell contains dense protoplasm and prominent nucleus.
iii. The cells are small isodiametric, oval or polygonal in shape.
iv. The cells are compactly arranged without intercellular spaces.
v. The cell wall is thin, elastic and made up of cellulose.
vi. It shows the presence of large number of mitochondria. The rate of respiration is very high owing to rapid metabolism.
vii. They contain few vacuoles or no vacuoles at all.
viii. Meristematic cells usually divide in a particular plane of division.

Q.103. Which is the most important characteristic of meristematic tissue?

Ans: The most important characteristic of meristematic tissue is the power of cell division.

Q.104. Give the classification of Meristems on the basis of origin and development.

Ans: On the basis of their origin and development, the meristems are divided into the following three types:

i. Promeristem / Primordial meristem:

The promeristem originates from embryo and is therefore called primordial or embryonic meristem. It occupies a small area at the tip of the stem and root.

ii. Primary meristem:

The meristematic cells which originate from promeristem after repeated divisions' produce primary meristem.

They are present at the apices of root and shoot and primordia of leaf.

The cells of this region are always in active state of division and gives rise to primary permanent tissue. They exist in the plant body right from the beginning.

e.g. Apical meristems present at the tip of root and stem.

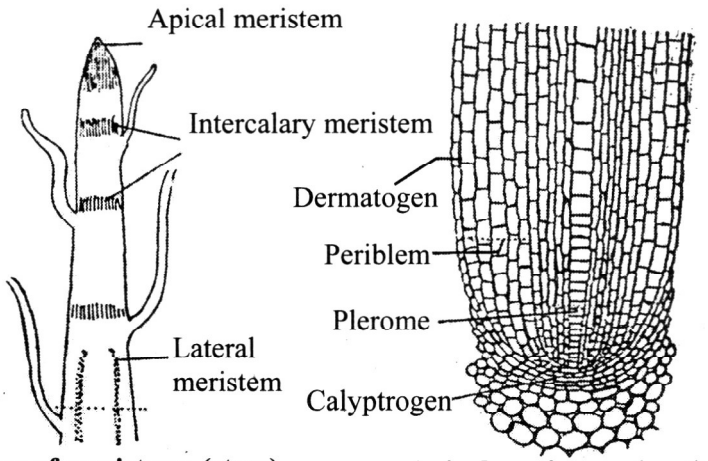
iii. Secondary meristem:

The meristems which are formed secondarily or later or during the growth of the plant are called

secondary meristems.
Cambium of root, interfascicular cambium of stem and cork cambium in both root and stem are examples of secondary meristems.
Secondary growth occurs due to the activity of these cells.
It increases the thickness of the plant parts.

Q.105. Classify meristems on the basis oftheir position in plant body and describe the different types.

Ans: On the basis of position in the plant body, meristems are classified into the following groups:



Positions of meristems

i. **Apical meristem:**
These are growing points which are situated at the apices of main as well as secondary root and shoot.
It divides continuously and brings about growth in length of shoot and root.
The apical meristem includes prorneristem as well as primary meristem.

ii. **Intercalary meristem:**
Intercalary meristems are the parts of apical meristems which get separated from them due to the formation of permanent tissue in between. They are present at the base of internode in grasses and wheat or at the base of node in mint.
It helps in growth of leaves and internodes.
In addition, it also plays an important role in prostrate stems to become erect.

iii. **Lateral meristem:**
These meristems are arranged parallel to the sides of the organs or around the central axis of the organ.
Their activity results in increasing the diameter of plant organs and development of secondary permanent tissues.
Vascular cambium and cork cambium are the common examples of such meristems.

Q.106. What is the function of inter-calary meristem?

Ans: Inter-calary meristem helps in elongation of internodes and petioles.

Q.107. Classify meristems on the basis of functions.

Ans: Meristems can be classified on the basis of functions as:

i. **Protoderm:** Protoderm is the outermost layer of young growing region which gives rise to epidermis (epidermal tissue system) in developing organs.

ii. **Procambium:** The cells of young growing region which give rise to primary vascular tissues by their elongation and differentiation are called procambium.

iii. **Ground meristem:** Ground meristem is the portion of young growing region which gives rise to hypodermis, cortex, endodermis, peri cycle, medullary rays and pith.

Q.108. Give the functions of meristem.

Ans: i. Meristems are responsible for growth by addition of new cells in various regions of the plants.
ii. Formation of new leaves, branches and flowers.
iii. Intercalary meristem helps in elongating the internodes, petiole and expanding leaf lamina.
iv. Root apices continuously add new structures to the roots, i.e. root hairs.
v. Vascular cambium adds new vascular tissues as older one becomes non-functional, hence helps in secondary growth.
vi. Cork cambium forms protective covering around stems and roots.

Q.109. What is simple permanent tissue?

Ans: The tissue composed of similar type of cells resembling in shape, size, function and form is termed as simple permanent tissue. These are of three types:
i. Parenchyma
ii. Collenchyma
iii. Sclerenchyma

Q.110. Write the characteristic features of permanent tissues.

Ans: Characteristics of permanent tissues:
i. Permanent tissues are composed of cells, which have lost the power of cell division and moulded into a particular form according to their function. .
ii. The cells of permanent tissue are mature and have definite shape, size and function.
iii. The cells maybe living or dead, either thin walled or thick walled.
iv. The cell wall is composed of cellulose, hemicellulose, pectin and lignin.

Q.111. Which are complex permanent tissues?

Ans: Xylem and phloem are complex permanent tissues.

Q.112. Why are xylem and phloem called complex tissue?

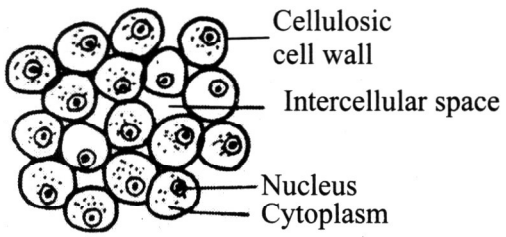
Ans: Both xylem and phloem are made up of more than one type of cells to perform one common function, i.e. conduction of water and food respectively.

Q.113. Describe parenchyma in detail.

OR

Write a note on Parenchyma.

Ans: Parenchyma (Gk. Para = beside, enchyma = to pour):
i. Parenchyma is the most simple, common unspecialized tissue.
ii. It is the most primitive type of tissue. From it, other tissues evolve and hence it is also called a fundamental tissue.
iii. The parenchyma cells are living, thin walled with distinct nuclei and vacuolated cytoplasm.
iv. The parenchyma consists of oval, round, polygonal, elongated, star-shaped or irregular cells.



Parenchyma

v. The cell wall is made up of cellulose and pectin.
vi. The cells of parenchyma are normally arranged loosely with intercellular spaces.
vii. The adjacent cells remain attached by plasmodesmata: or cytoplasmic bridges.

Occurrence:
i. Parenchyma is widely distributed in the plant body such as stem, roots, leaves, flowers and fruits.
ii. It is found in the soft parts of the plants such as cortex of roots, ground tissue in stem and mesophyll of leaves, pulp of fruits and endosperm of seeds.

iii. It is also present in pith and as a packing tissue in xylem and phloem.

Types of parenchyma:

Parenchyma is modified to perform special functions:

i. **Prosenchyma:** Sometimes the parenchymatous cells become thick walled due to deposition of cellulose, they are fibre like, elongated and pointed at both ends called prosenchyma, which provides strength and rigidity. .

ii. **Aerenchyma:** Parenchyma cells which have large intercellular spaces filled with air are called aerenchyma. It gives aeration and buoyancy to aquatic plants. e.g. Eichhornia, hydrilla, etc.

iii. **Chlorenchyma:** Chlorenchyma is a parenchyma tissue, which contains large number of chloroplasts. It helps in the process of photosynthesis.

iv. **Xylem and Phloem parenchyma:** This parenchyma present in the xylem and phloem acts as a packing tissue. It helps in storage and conduction of water and food materials.

Q.114. What is the function of aerenchyma?

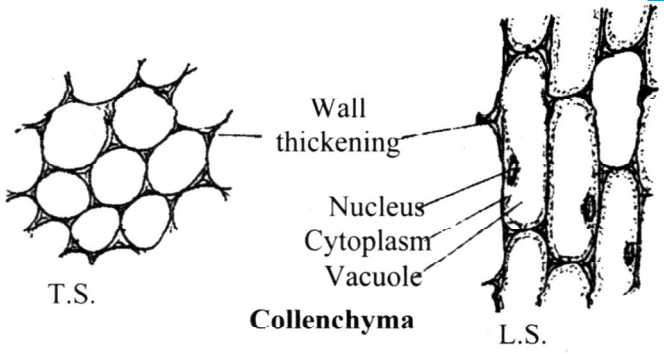
Ans: Aerenchyma serves to store air and help the organ to float on water.

Q.115. Describe the living tissue that gives flexible mechanical strength.

OR

Write a short note on coUenchyma.

Ans:



Collenchyma

Collenchyma (Greek, colla = glue, enchyma = to pour) Structure:

i. Collenchyma is living, simple, permanent tissue.

ii. The cells are elongated with blunt ends and look spherical in T.S.

iii. Intercellular spaces are absent.

iv. The cell walls are made up of cellulose, hemicellulose and pectin but never lignin, cell walls are unevenly thickened.

v. Thickening of cells are confined only to the corners of the cells, making cell wall rigid.

vi. Collenchyma cells may contain chloroplast.

Occurrence:

The cells of collenchyma are located below the epidermis (hypodermis) of herbaceous dicotyledonous, stem.

Functions:

i. It provides tensile strength which gives elasticity and support to growing organisms.

ii. Collenchyma allows growth and elongation of organs and prevents tearing of leaves.

iii. It is present at the margins of some leaves and resists tearing effect of the wind.

iv. Some collenchyma cells possess chloroplasts and perform photosynthesis.

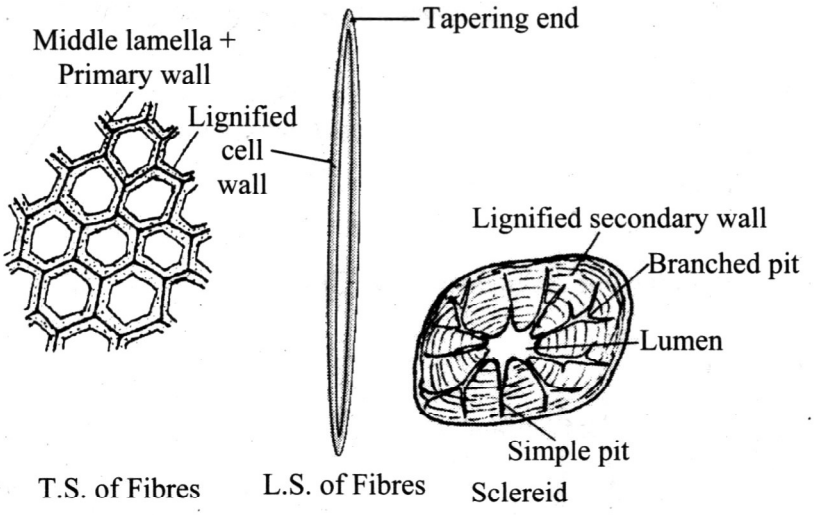
Q.116. With a suitable diagram describe Sclerenchyma. Add a note on its occurrence and types. Also explain its functions.

Ans: Sclerenchyma (Greek- scleros = hard, enchyma = to pour) Structure:

i. Sclerenchyma cells are thick walled, dead, simple, permanent tissues.

ii. Cells are devoid of protoplasm.

iii. Cells are compactly arranged, thus without intercellular spaces.
iv. The cell walls are highly lignified and evenly thickened.



Sclerenchyma

Types of Sclerenchyma:

Sc1erenchyma cells are categorized into two types on the basis of their size and shape as sc1ereids and fibres:

i. Fibre:

Fibre cells are long, narrow and thick walled, pointed at both the ends and are lignified. They look polygonal in transverse section, but are elongated with tapering ends.

Functions of Fibres:

They provide mechanical strength to the plant part.
They help in conduction of water when present in secondary xylem.

ii. Sclereids:

They are mostly isodiametric or polyhedral, some cells are elongated, rod shaped, bone shaped or star shaped.
Sclereids develop from parenchyma cells.
Their walls become very thick, hard and strongly lignified, lumens remain narrow, so also called as stone cells and occur singly or in groups to provide stiffness.
sclereids are present in cortex and phloem of stem and roots and are most abundant in the covering of seeds and nuts.

Functions of Sclereids:

Sc1ereids provide mechanical strength to the part of the plant where they are present.
It also develops resistance in the plant against unfavourable conditions.

Q.117. Write the differences between fibres and sclereids.
Ans:

No.	Fibres	Sclereids
i.	They are narrow, elongated and fibre like.	They are usually short and broad.
ii.	They occur in bundles.	They occur individually or in small groups.
iii.	They are unbranched.	They may be branched.
iv.	They are derived directly from meristematic cells.	They develop by secondary thickening of parenchyma cells.

Q.118. Which cells are also called stone cells?

Ans: Sc1ereids are also known as stone cells.

Q.119. Give a brief account of water conducting tissues of higher plants.

OR

Describe the structure of xylem.

Ans: Xylem or wood or hardrome (Greek, Xylos = wood)

Xylem or wood is a complex permanent tissue which conducts minerals (inorganic sap) or water, upwards from roots to the leaves.

It also provides mechanical strength to the plant body.

Xylem is made up of four types of cells-tracheids, vessels (tracheae), xylem (fibre) and xylem parenchyma.

i. Tracheids:

Tracheids are elongated, tube-like.xlead cells (without protoplasm) with tapering ends with lumen and lignified walls except at certain points called pits.

Tracheids are commonly found in pteridophytes, gymnosperms and xylem of angiosperms.

Tracheids possess thickening on their walls. They may be annular (ring like), spiral (helical), scalariform (ladder like), reticulate (net like) and pitted in the order of evolution.

Pitted is the most advanced type of thickening.

Function:

The main function of tracheids is to conduct water and dissolved mineral salts from root to the stem, leaves and floral parts.

ii. Vessels or tracheae:

Vessels are long, cylindrical, tube-like cells placed end to end in longitudinal series with their end walls perforated or dissolved.

The mature cells are dead with thick lignified walls, relatively less thick and the lumen is wide.

Vessels like tracheids, have thickenings as annular, spiral, scalariform, reticulate and pitted in the order of evolution.

Vessels are present in angiosperms but absent in gymnosperms and pteridophytes.

Perforation plate is the region where the vessels are connected with each other through pores due to which it looks like a pipe.

Function:

Vessels are the chief conducting elements of vascular plants, particularly in angiosperms.

They translocate water and dissolved mineral salts or nutrients from root to the leaves.

They provide mechanical support to the plant.

iii. Xylem fibres:

They are sclerenchymous cells associated with xylem tissue.,

They are long, narrow, spindle shaped cells, thick and highly lignified cells usually pointed at both ends.

Xylem fibres are dead cells bearing a narrow lumen.

Function:

Xylem fibres provide mechanical strength to the xylem and to the plant body.

iv. Xylem parenchyma (wood parenchyma):

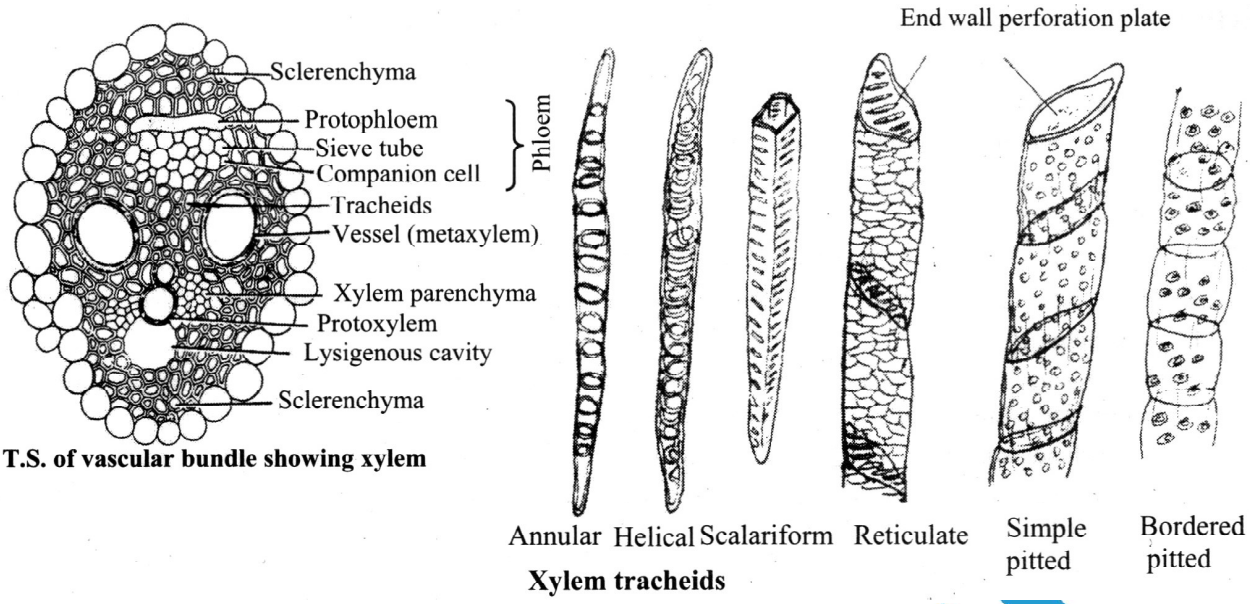
It consists! of living parenchyma cells present in xylem in association with tracheids and vessels.

Xylem parenchyma cells have a thin-wall made up of cellulose.

Functions:

It helps in lateral conduction of water or sap.

It also stores food material.



T.S. of vascular bundle showing xylem

Xylem tracheids

Q.120. Write the difference between tracheids and vessels.
Ans:

No.	Tracheids	Vessels
i.	A tracheid consists of a single cell which is elongated and possesses tapering end walls.	A vessel consists of a row of cells placed one above the other in a tubular form with total or partial disappearance of the cross walls.
ii.	Tracheids are narrow in diameter.	Diameter of vessels is much greater than that of tracheids.
iii.	Tracheids are short upto one mm in length.	The vessels are longer may be as long as 10 cm.

Q.121. Describe the structure of phloem.
Ans: Phloem or bast or leptome:

Phloem is, the chief food conducting complex tissue of vascular plants responsible for translocation of organic (solutes) substances.

The phloem is composed of four different kinds of cells (elements).

They are sieve elements, companion cells, phloem parenchyma and phloem sclerenchyma (fibres).

i. Sieve elements (Sieve cells and sieve tubes)

a. Sieve cells are narrow, elongated cells with tapering ends. Sieve areas are located laterally. Sieve cells are present in Pteridophytes and Gymnosperms. Sieve tubes are present in angiosperms. Sieve tubes are made up of many elongated cells which are joined end to end.

b. They possess cytoplasm, but are devoid of nuclei though it is living and the nucleus of companion cell controls its activities.

c. Their end walls are perforated like a sieve and hence they are called sieve plates.

d. Due to presence of sieve plates, the contents of one cell, is in communication with the other.

Function:

The main function of the sieve cells and tubes is transportation of prepared food materials from leaves to the storage organs in downward direction and then to growing regions in the upward direction (bi-directional).

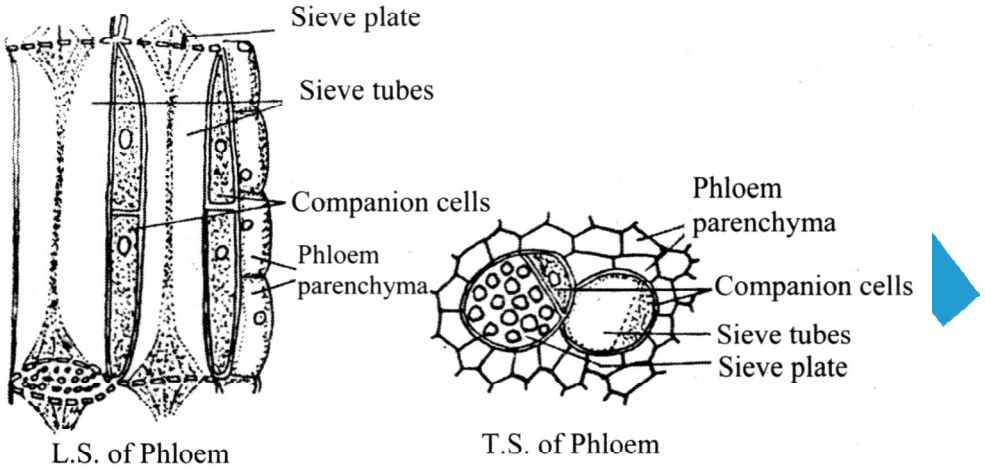
ii. Companion cells:

These are specialized parenchyma cells always associated with the sieve tubes.

The companion cells are absent in pteridophytes and gymnosperms.
They have nucleus, mitochondria, endoplasmic reticulum, plastids, ribosomes, etc.
Nuclei of companion cells control the metabolic activities of sieve tubes.

iii. Phloem parenchyma:
These are thin walled living parenchyma cells.
The cells have cytoplasm and nucleus.
Phloem parenchyma cells store food material and help in conduction.

iv. Phloem fibre:
It is also called bast fibres.
The fibres of secondary phloem are elongated.
The cells are lignified with simple pits.
They provide mechanical support and give strength and rigidity to the organs.



Elements of Phloem

Q.122. What is hard bast?
Ans: Sclerenchymatous patch associated with the phloem is called as hard bast.

Q.123. Differentiate between xylem and phloem.
Ans:

No.	Xylem	Phloem
i.	It is a dead complex tissue.	It is a living complex tissue.
ii.	It is composed of xylem, tracheids, vessels, xylem fibres and xylem parenchyma.	It is composed of sieve tubes, sieve cells, companion cells, phloem parenchyma and phloem fibres.
iii.	It is a water conducting tissue.	It is a food conducting tissue.
iv.	It is also known as wood.	It is also known as bast.
v.	The cell walls are thick due to lignin.	The cell walls are thin.

Q.124. Describe various types of vascular bundles.
Ans: The vascular tissues occur in the form of distinct patches called vascular bundles. Vascular bundle is a strand of vascular tissues, i.e. xylem and phloem. According to the arrangement of xylem and phloem, vascular bundles are classified into the following types:

i. Radial vascular bundles:
Radial vascular bundles are the one in which xylem and phloem are arranged on different radii.
The xylem and phloem bundles are arranged alternating with each other.
They are present in the roots.

ii. Conjoint vascular bundles:

A vascular bundle in which xylem and phloem are present on the same radius is called a conjoint vascular bundle.

Here, xylem and phloem together form a bundle.

They are of two types:

a. Collateral vascular bundle:

In this type of vascular bundle, xylem lies inwards and the phloem lies outwards.

Indicot stem, cambium is present in xylem and phloem.

Such vascular bundles are called open (secondary growth takes place).

In monocot stem, cambium is absent and such vascular bundles are called closed (secondary growth is absent).

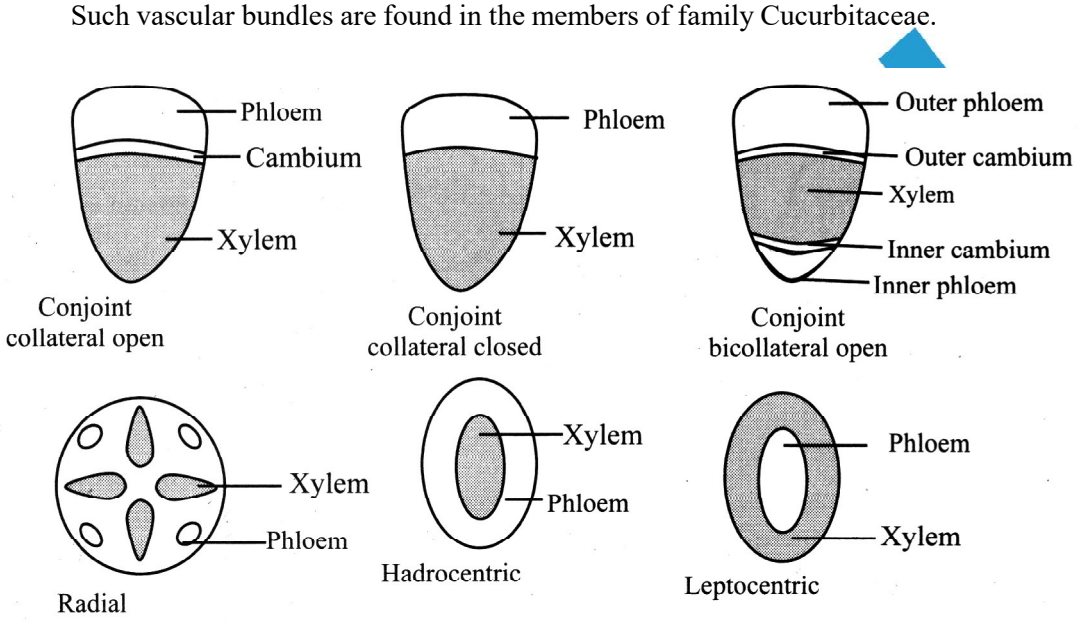
b. Bicollateral vascular bundle:

The vascular bundle in which phloem occurs in two groups inside and outside the xylem is called a bicollateral vascular bundle.

In such type of vascular bundle, there are two strips of cambium, one on either side of xylem.

They are always open.

Such vascular bundles are found in the members of family Cucurbitaceae.



Types of vascular bundles

iii. Concentric vascular bundle:

The conjoint vascular bundle in which one type of vascular tissue is surrounded by other is called concentric vascular bundle.

When xylem is surrounded by phloem, it is called hadrocentric and when phloem is at the centre, it is called leptocentric.

Concentric vascular bundles are always closed.

They are found in the members of Pteridophyta .

Q.125. Why vascular bundles of dicot stem are described as conjoint, collateral and open?

Ans: The vascular bundles ofdicot stem are described as conjoint, collateral and open because xylem and phloem are present on the same radius with cambium lying between xylem and phloem.

Q.126. How is the arrangement of vascular bundles in dicot and monocot stem?

Ans: In dicot stem, vascular bundles are arranged in a ring, while in monocot stem they are scattered.

Q.127. In which type of vascular bundle secondary growth can take place?

Ans: Secondary growth can take place in open vascular bundle.

Q.128. What is concentric vascular bundle?

Ans: The conjoint vascular bundle, in which one type of vascular tissue is surrounded by the other, is called concentric vascular bundle.

Q.129.Why concentric bundles are always closed?

Ans: Concentric bundles are always closed as they do not possess cambium between the xylem and phloem.

Q.130. How are the vascular bundles of root?

Ans: In root, the vascular bundles are radial, since xylem and phloem strands occur separately on different radii.

5.4 : Anatomy of Root, Stem and Leaf :

Q.131. With the help of a neat labelled diagram, describe the anatomy of a dicot root.

OR

Sketch, label and describe the T.S. of dicot root.

Ans: The T.S. of dicot root shows the following plan of arrangement from outer side (periphery) to the centre of the organ.

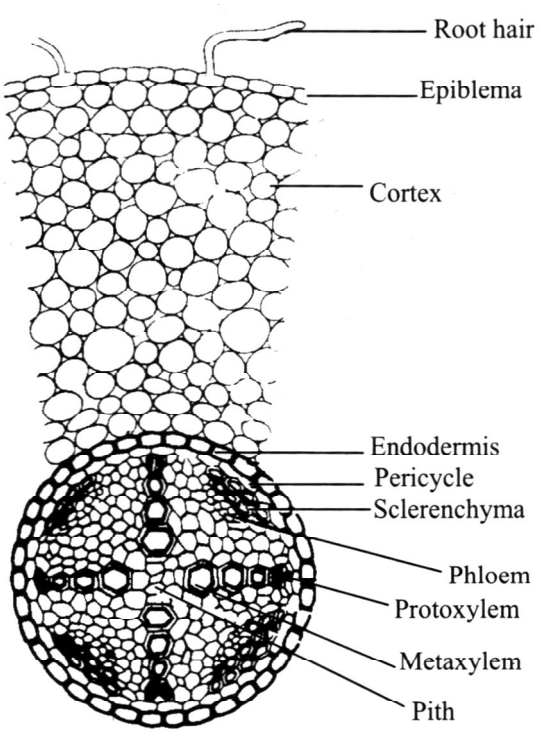
i. **Epiblema or Epidermis:** It is the outermost single layer of cells without cuticle. Some epidermal cells prolong to form unicellular root hairs.

ii. **Cortex:** Cortex is made up of many layers of thin walled parenchyma cells with conspicuous intercellular spaces. The cells contain starch grains. The last layer of cortex is called endodermis.

iii. **Endodermis:** Endodermis consists of compactly arranged barrel shaped cells forming a distinct zone around the stele. The cells contain casparian strips on their radial wall. Near the protoxylem, there are unthickened passage cells.

iv. **Pericycle:** Next to the endodermis, there is a single layer of thin walled parenchyma cells called pericycle. It forms outermost layer of stele or vascular cylinder.

v. **Stele:** Stele is radial. Xylem and Phloem occur in separate patches arranged on alternate radii. Xylem is exarch in root that means protoxylem vessels are towards periphery and metaxylem elements are towards centre. Xylem bundles vary from two to six number, i.e. they may be diarch, triarch, tetrarch, etc.



T.S. of dicot (sunflower) root

vi. **Connective tissue:** A parenchymatous tissue is present in between xylem and phloem.

vii. **Pith:** The central part of stele is called pith. It is narrow and made up of parenchymatous cells.

Q.132. What is polyarch condition?

Ans: Polyarch condition is the one in which roots possess more than six xylem bundles.

Q.133. With the help of a neat labelled diagram, describe the T.S. of a monocot root.

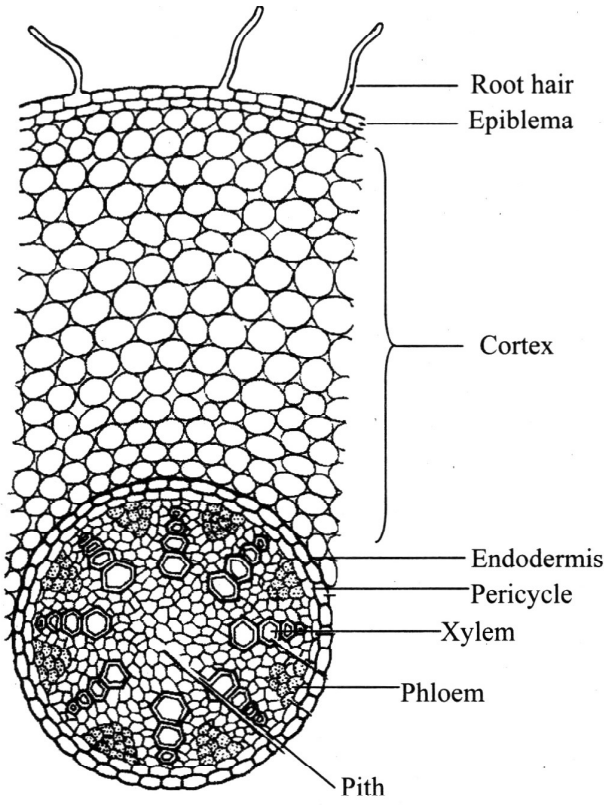
Ans: T.S. of mono cot root shows the following structure from periphery to the centre.

i. **Epiblema or Epidermis:** It is outermost layer made up of single layer of thin walled cells. Some of the cells of epidermis grow out into root hairs.

ii. **Cortex:** Immediately below the epidermis, massive cortex is present. It consists of thin walled parenchyma cells with intercellular spaces.

iii. **Endodermis:** It is innermost layer of cortex. The cells of endodermis are thick walled except the passage cells which lie just opposite to the protoxylem. The inner and radial walls of endodermal cells

are more thickened than those of the outer walls.



T.S. of a monocot (maize) root

iv. **Pericycle :** There is uniseriate peri cycle below the endodermis.

v. **Stele:** Xylem and phloem are present as separate patches alternately. Xylem is exarch. Polyarch condition is observed (xylem groups are more than six). Cambium is absent as there is no secondary thickening. Peri cycle gives rise to lateral roots.

vi. **Pith:** Pith is large and well developed, made up of parenchymatous cells.

Q.134. Distinguish between anatomy of dicot and monocot roots.

Ans:

No.	Dicot root	Monocot root
i.	Pith is small or absent.	Pith is large and well developed.
ii.	Cambium is present.	Cambium is absent.
iii.	Xylem bundles vary from two to six.	Xylem bundles are more than six.

Q.135. What are casparian strips?

Ans: Thickening of suberin developed in the form of a band or strip which run completely around the endodermal cells on the radial walls and end walls, are called casparian strips.

Q.136. What are passage cells or transfusion cells?

Ans: Among the thick walled cells of endodermis, there occur isolated thin walled cells usually opposite the. protoxylem elements, which are known as passage or transfusion cells. Through these cells, the sap absorbed by root hairs enter the xylem elements.

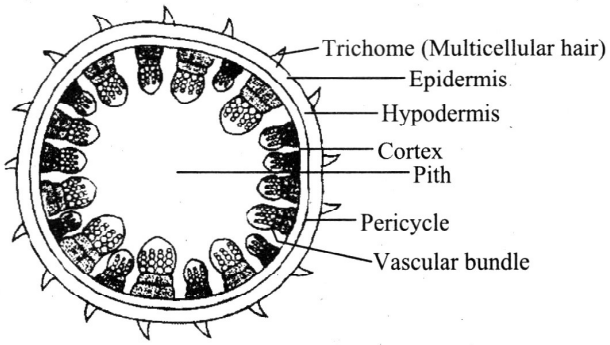
Q.137. With the help of a neat labelled diagram, describe T.S. of dicot stem (sunflower).

OR

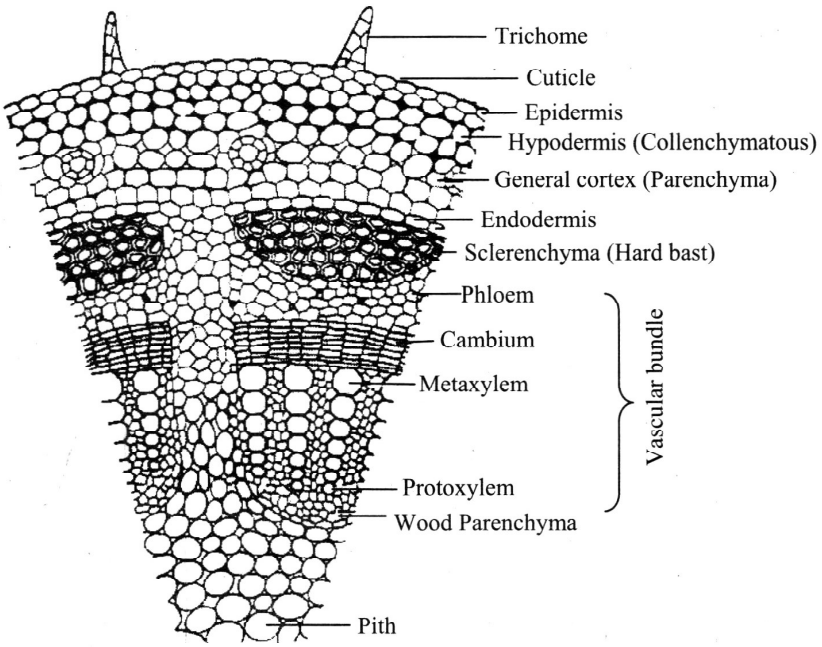
Sketch, label and describe T. S. of typical dicot stem.

Ans: Young dicot stem shows three distinct regions:

i. Epidermis ii. Cortex iii. Stele



Gross anatomy of sunflower stem



A part of T.S. of young sunflower stem

i. **Epidermis:** It is the outermost, single layer of cells. It produces multicellular trichomes (hairs). This layer prevents the rate of transpiration and protects the underlying tissues from mechanical injury and from disease producing organisms.

ii. **Cortex:** Next layer to epidermis is the cortex. Cortex is divided into three regions namely, hypodermis, general cortex and endodermis.
   a. Hypodermis lies just below epidermis and is made up of 3-4 layers of collenchyma. It gives mechanical strength.
   b. General cortex is made up of many layers of parenchyma cells with inter-cellular spaces.
   c. Endodermis is an innermost layer of cortex made up of single layer of barrel shaped compact cells. Casparian strips are present in the radial wall of endodermis.

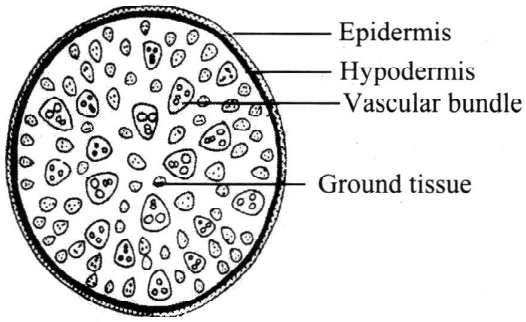
iii. **Stele:** The part of the stem inside the cortex is known as stele. Stele consists of three regions: the pericycle, vascular bundle and the pith.
   a. Pericycle: The region between the vascular bundles and the cortex is known as pericycle. It consists of parenchyma and sclerenchyma cells. Sclerenchyma cells are present in patches.
   b. Vascular bundle: Vascular bundles are arranged in the form of a ring. It is conjoint, collateral and open. Xylem is present towards the centre of the stem, phloem is present towards the periphery and cambium is present in between xylem and phloem. Conjoint means xylem and phloem are present on the same radius. When xylem is towards the centre and phloem lies

towards periphery, it is described as collateral. Open means cambium is present in between xylem and phloem.

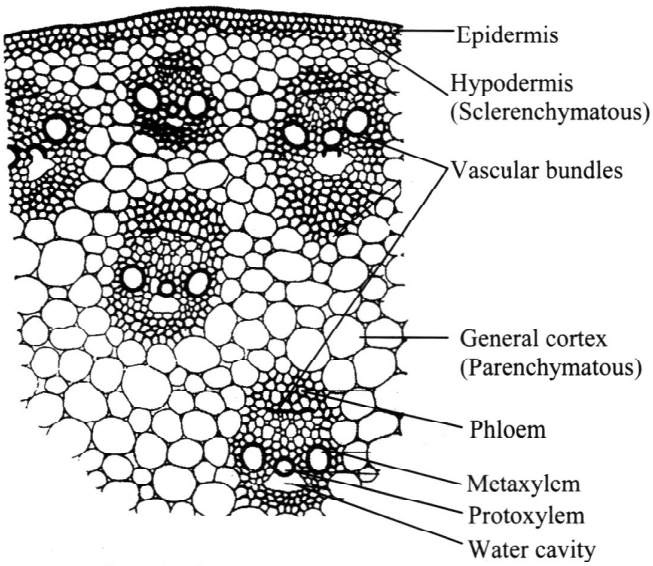
c. **Pith:** It consists of thin walled parenchyma cells. These cells have distinct intercellular spaces.

Q.138. With the help of a neat labelled diagram, describe the structure of monocot stem.

Ans: Monocotyledonous stems are similar to dicotyledonous stems in having an epidermis, cortex and stele. However, there is a difference in the structure and arranzement of vascular bundles.



Gross anatomy of a monocot stem (Maize)



A part of T. S. of a monocot stem (Maize)

The parts shown by typical monocot stem (maize) are as follows:

i. **Epidermis:** It consists of a single layer of compact cells. It is covered with thick cuticle. Epidermal hairs are absent.

ii. **Hypodermis:** Below the epidermis, usually two to three layers of sclerenchyma cells represent hypodermis.

iii. **Ground tissue:** It consists of thin walled parenchyma cells. It extends from hypodermis to the centre. It is not differentiated into cortex, endodermis, peri cycle and pith.

iv. **Vascular bundles:** Vascular bundles are scattered in the ground tissue. They are collateral and closed (cambium is absent). The vascular bundles which lie towards periphery are more in number and smaller in size than the central ones. Each vascular bundle is surrounded by a sheath. Xylem is endarch.

Usually, xylem is V-shaped having bigger metaxylem and smaller protoxylem vessels. Lysigenous cavity is seen below protoxylem. Phloem is situated between the two limbs of the 'V' shaped xylem.

Q.139. Define :

i. **Intrafascicular cambium**

ii. **Interfascicular cambium**

Ans: i. Intrafascicular cambium: The cambium present between the primary xylem and primary phloem of a vascular bundle is called intrafascicular cambium.

ii. **Interfascicular cambium:** The cells of medullary rays adjoining intrafascicular cambium strips become meristematic and form the interfascicular cambium.

Q.140. What is spring wood and autumn wood?

Ans: i. During spring, cambium produces large number of xylem elements and vessels, this is called spring wood or early wood.

ii. During winter, cambium is less active and produces xylem elements and narrow vessels, this is called autumn wood or late wood.