6

Anatomy of Flowering Plants

Multiple Choice Questions (MCQs)

Q. 1 A transverse section of stem is stained first with safranin and then with fast green following the usual schedule of double staining for the preparation of a permanent slide. What would be the colour of the stained xylem and phloem?

(a) Red and green
(b) Green and red
(c) Orange and yellow
(d) Purple and orange

Thinking Process

Different kinds of stains are used to colour the plant tissues to facilitate the histological studies. Safrinin and fastgreen are few of them.

Ans. *(a)* The xylem is coloured red with safrinin and phloem green with fast green, whereas other colours are not given by safranin and fast green.

Q. 2 Match the following columns.

Column I		Column II	
A.	Meristem	1.	Photosynthesis, storage
B.	Parenchyma	2.	Mechanical support
C.	Collenchyma	3.	Actively dividing cells
D.	Sclerenchyma	4.	Stomata
E.	Epidermal tissue	5.	Sclereids

Codes

A B C D E	A B C D E
(a) 1 3 5 2 4	(b) 3 1 2 5 4
(c) 2 4 5 1 3	(d) 5 4 3 2 1

Thinking Process

The cells get specialised to perform special functions in different plant organs.

Ans. *(b)* **Meristem** It is a group of actively dividing cells which is responsible for the life long growth occurring in the plants.

Parenchyma It is a permanent tissue and widely distributed in plant body. It is mainly involved in photosynthesis in chlorophyll containing cells and also store food materials.

Collenchyma The cells of collenchyma tissue have thickening at corners of cells and this provide mechanical strength to herbaceous green stems.

Sclerenchyma This tissue is dead at maturity, have thickening along all sides of walls. Sclereids and fibre are this types of tissue.

Epidermal tissue The epidermal tissue system forms the otuer most covering of the whole plant body and comprises epidermal cells, stomata and the epidermal appendages the trichomes and hairs.

Q. 3 Match the following columns.

	Column I		Column II
A.	Cuticle	1.	Guard cells
B.	Bulliform cells	2.	Single layer
C.	Stomata	3.	Waxy layer
D.	Epidermis	4.	Empty colourless cell

Codes

	A	B	C	D
(a)	3	4	1	2
(c)	3	2	4	1

	A	B	C	D
(b)	1	2	3	4
(d)	3	2	1	4

Ans. *(a)* **Cuticle** It is a waxy layer present all over the plant body except root.

Bulliform Cells These are empty colourless cells when the bulliform cells in the leaves absorbed water and becomes turgid the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves, curl inwards to minimise water loss.

Stomata These are minute apertures in the epidermis, meant for gas exchange. Each aperture is bounded by two kidney shaped cells, called guard calls. Guard cells control closing and opening of stomata.

Epidermis It is generally uniseriate, *i.e.,* composed of single layer of epidermal cells. In some cases epidermis may be multilayered, *e.g., Ficus*, *Nerium*.

Q. 4 Identify the tissue system from among the following.

(a) Parenchyma (b) Xylem (c) Epidermis (d) Phloem

Ans. *(c)* **Epidermis** is usually a single layered structure, present on the entire body surface of the plant and this makes epidermal tissue system. It consists of epidermis, cuticle, stomata unicellular hairs and multicellular trichomes.

Whereas, **parenchyma** is a kind of tissue present in all organs of the plant, *e.g.,* roots, stems, leaves, flowers, fruits and seeds.

Xylem and **phloem** are the complex tissue found in all vascular plants.

Q. 5 Cells of this tissue are living and show angular wall thickning. They also provide mechanical support. The tissue is

(a) xylem (b) sclerenchyma (c) collenchyma (d) epidermis

Thinking Process

Cell walls of the plant tissue some times get deposited with chemicals like lignin, suberin and harden to give mechanical strength to tissues and plant parts.

Ans. *(c)* **Collenchyma** This tissue provide mechanical support mainly to herbaceous young growing stem. The cells have angular thickening at the corners. Whereas, **xylem** is conductive complex tissue, transports water and mineral.

Sclerenchyma is dead at maturity, present in hard areas of the plant. **Epidermis** is usually a single layered structure present on the entire body surface of the plant.

Q. 6 Epiblema of roots is equivalent to

(a) pericycle (b) endodermis (c) epidermis (d) stele

Ans. *(c)* **Epidermis** It is usually a single layered structure, present all over the body surface of the plant. In case of root, it is called epiblema instead of epidermis.

Whereas **stele** is collective term for vascular tissues in case of vascular plants (pteridophyte gymnosperms and angiosperms).

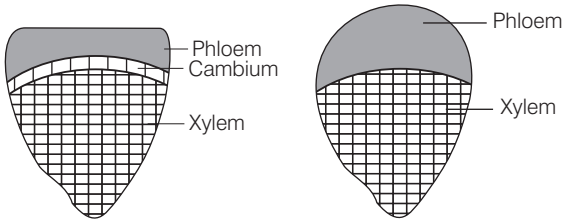
Endodermis and **Pericycle** are the part of root or stem encircling vascular strands.

Q. 7 A conjoint and open vascular bundle will be observed in the transverse section of

(a) monocot root (b) monocot stem (c) dicot root (d) dicot stem

Ans. *(d)* **Dicot Stem**

Vascular bundles are said to be open when cambium is present in between the xylem and phloem. Conjoint means the xylem and phloem are united and are present on the same radius.



Open, conjoint vascular bundle **Closed, conjoint vascular bundle**

Q. 8 Interfascicular cambium and cork cambium are formed due to

(a) cell division (b) cell differentiation
(c) cell dedifferentiation (d) redifferentiation

Ans. *(c)* Interfascicular cambium and cork cambium are formed due to cell dedifferentiation.

Differentiation The process which leads to maturation of cells is called differentiation. During differentiation, a few or major changes happen in protoplasm and cell walls of the cells.

Dedifferentiation A differentiated cell can regain its capacity for cell division under certain conditions. This phenomenon is called dedifferentiation. Formation of interfascicular cambium and cork cambium from fully differentiated parenchyma cells is an example of dedifferentiation.

Redifferentiation A dedifferentiated plant cell once again loses its capacity to divide and becomes mature. This phenomenon is called redifferentiation.

Q. 9 Phellogen and phellem respectively denote

(a) cork and cork cambium (b) cork cambium and cork
(c) secondary cortex and cork (d) cork and secondary cortex

Ans. *(b)* **Cortical Cells** In the dicot stem the cortical cells gets differentiated to give rise to another meristematic tissue which is called cork cambium or phellogen. On the outer side it forms phellem (cork) and in the inner region it forms secondary cortical cells (phelloderm).

Q. 10 In which of the following pairs of parts of a flowering plant is epidermis absent?

(a) Root tip and shoot tip (b) Shoot bud and floral bud
(c) Ovule and seed (d) Petiole and pedicel

Ans. *(a)* Root and shoot tip of an actively growing plant has high meristematic activity. The cells in this region are highly active and keep dividing. So, the cells do not get differentiated to epidermal tissue, so epidermis is absent in root and shoot tips.

Q. 11 How many shoot apical meristems are likely to be present in a twig of a plant possessing, 4 branches and 26 leaves?

(a) 26 (b) 1 (c) 5 (d) 30
(e) 4

Ans. *(c)* **Apical Meristem** It is always present at the growing apices. Plants having 4 branches and 26 leaves will have 5 growing apices (4 growing apex of the branches + one growing apex of the main plant axis).

Q. 12 A piece of wood having no vessels (trachea) must be belong to

(a) teak (b) mango (c) pine (d) palm

Ans. *(c)* **Pine** It is a gymnosperm. The plants belonging to this group do not have vessels instead, they have trachieds. Whereas teak, mango and palm are angiospermic trees. Angiospermic xylem contains vessels, tracheids, parenchyma and fibres.

Q. 13 A plant tissue, when stained, showed the presence of hemicellulose and pectin in cell wall of its cells. The tissue represents

(a) collenchyma (b) sclerenchyma (c) xylem (d) meristem

Ans. *(a)* **Collenchyma** It is a group of specialised cells meant for mechanical support. It has the thickening at the corners of the cells which is mainly because of the deposition of pectin and hemicellulose.

Q. 14 Fibres are likely to be absent in

(a) secondary phloem (b) secondary xylem
(c) primary phloem (d) leaves

Thinking Process

Leaves have mainly photosynthetic tissues so, the cells are adapted to carry out photosynthesis.

Ans. *(d)* **Leaves** The leaves of the plants are mainly the organ of photosynthesis. It has specialised parenchymatous cells having chlorophyll. It does not have any fibrous cells.

Q. 15 When we peel the skin of a potato tuber, we remove

(a) periderm (b) epidermis

(c) cuticle (d) sapwood

Ans. ***(a)*** **Periderm** Patato is a underground stem. The outer epidermal layer of the stem is known as periderm. So when we remove skin of potato, we are actually removing the periderm.

Q. 16 A vesselless piece of stem possessing prominent sieve tubes would belong to

(a) *Pinus* (b) *Eucalyptus*

(c) Grass (d) *Trochodendron*

Ans. ***(d)*** *Trochodendron* The species of this genus have a very unique feature of the angiosperms, *i.e.,* it lack vessel elements in its wood, but has prominent sieve tube cells.

Q. 17 Which one of the following cell types always divide by anticlinal cell division?

(a) Fusiform initial cells (b) Root cap

(c) Protoderm (d) Phellogen

Ans. ***(d)*** **Phellogen** It is secondary meristematic tissue which develops from the cells of cortical region of dicot stem. It is responsible for secondary growth. It's cells divide on both sides, *i.e.,* anticlinal division occurs.

On the outerside of stem, it gives rise to cork or phellem and on innerside phelloderm or secondary cortex.

Q. 18 What is the fate of primary xylem in a dicot root showing extensive secondary growth?

(a) It is retained in the centre of the axis

(b) It gets crushed

(c) May or may not get crushed

(d) It gets surrounded by primary phloem

Ans. ***(a)*** **Primary xylem** is present in the centre of the root. As secondary growth occurs in the root the primary phloem is pushed outside whereas, primary xylem remains inside of the root.

Very Short Answer Type Questions

Q. 1 Product of photosynthesis is transported from the leaves to various parts of the plants and stored in some cell before being utilised. What are the cells/tissues that store them?

Thinking Process

Glucose is the first product of photosynthesis. It is highly reactive molecule. It gets converted into a disaccharide-sucrose which has 2 glucose molecule joined by α-1-4 glycosidic linkage. This is a ready form of sugar for transportation.

Ans. The food gets stored in specialised parenchymatous cells present either in roots and stems or in their modifications in the form of a polysaccharide called starch.

Q. 2 Protoxylem is the first formed xylem. If the protoxylem lies next to phloem what kind of arrangement of xylem would you call it?

Thinking Process

Xylem is a complex permanent tissue which develops from primary meristematic tissue. It functions for the transportation of water and minerals in the plant.

Ans. It protoxylem lies next to phloem the condition of the xylem arrangement is called as exarch. It is found roots.

Q. 3 What is the function of phloem parenchyma?

Thinking Process

Phloem is complex conductive tissue responsible for conduction of food material to all parts of the plant. It has four kinds of cells-sieve tube/cell, phloem parenchyma, phloem fibre and companion cells.

Ans. The main function of phloem parenchyma is to store food and other substances like resins, latex and mucilage. They also help in transport of food.

Q. 4 What is present on the surface of the leaves which helps the plant prevent loss of water but is absent in roots?

Thinking Process

Plant continuously lose water from its body surface, specially leaves through the process of transpiration. To prevent this loss, different plants have devised different mechanisms to prevent this loss of water.

Ans. **Cuticle** It is a waxy coating covering the entire plant body surface. It is absent in roots, it prevents the loss of water through the surface of the plant body.

Q. 5 What is the epidermal cell modification in plants which prevents water loss?

Ans. Bulliform cells check the water loss. Bulliform or motor cells are modified epidermal cells present in monocots or grasses. Under stressed conditions, they help in shutting down stomata and thus reduce water loss through transpiration.

Q. 6 What part of the plant would show the following?

(a) Radial vascular bundle

(b) Polyarch xylem

(c) Well developed pith

Thinking Process

Plant tissues exhibit special characteristics in root, stem and leaves. Just by looking at them, it can be confirmed whether tissue is from which part of the plant.

Ans. (a) **Radial Vascular Bundle** The xylem and phloem are present on the separate radii of the root. This arrangement of vascular bundle is known as radial vascular bundle.

(b) **Polyarch Xylem** When many strands of xylem are present, it is referred to as polyarch condition-a characteristic feature of monocot root.

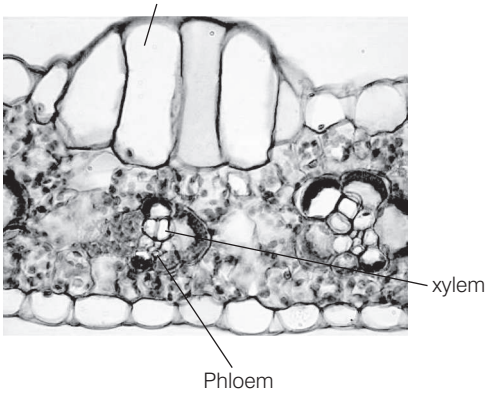
(c) **Well Developed Pith** Dicot stem and monocot roots have well developed pith formed of parenchymatous cell with intercellular spaces..

Q. 7 What are the cells that make the leaves curl in plants during water stress?

Thinking Process

Plant loses water continuously by the process of transpiration. It is called the 'necessary Evil'. The plants have developed certain structures and mechanism to combat this problem.

Ans. Bulliform cells are bubble shaped cells present in grasses. Loss of turgor pressure in these cells causes leaf to curl during water stress, thus reduce transpiration.



TS of monocot leaf showing bulliform cells

Q. 8 What constitutes the cambial ring?

Thinking Process

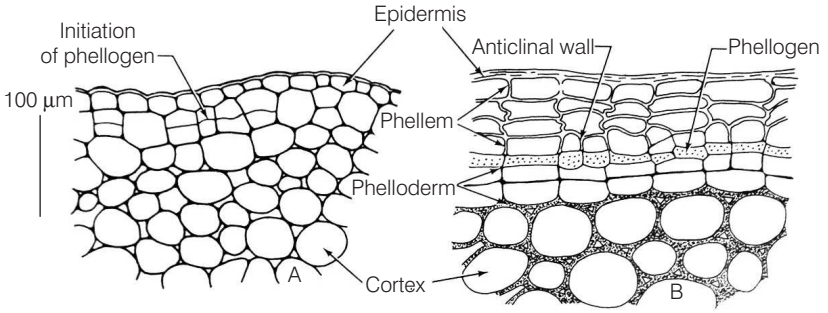
Cambium is a meristematic tissue. It is found in dicot plants and is responsible for secondary growth of stem and roots.

Ans. Interfascicular and intrafascicular cambia together form a ring of cambium called cambial ring. It is formed due to the meristematic activity of cambium.

The cambium which is found between the xylem and phloem is called **fasicular** or intrafasicular **cambium** and the newly formed cambium between the two vascular bundle is known as **interfasicular cambium**. Both type of cambium combine to form the cambial ring.

Q. 9 Give one basic functional difference between phellogen and phelloderm.

Ans. Phellogen is a meristematic tissue, while phelloderm is a permanent tissue. Phellogen (cork cambium) develops from the cortical cells, sometimes from pericycle cells. These cells actively divide and forms phellem on outerside and phelloderm (cortex cells)innerside on so phelloderm takes its origin from phellogen.



Formation of phellogen and phelloderm

Q.10 Arrange the following in the sequence you would find them in a plant starting from the periphery-phellem, phellogen, phelloderm.

Ans. Phellem or cork is the outer most layer, followed by phellogen (cork cambium) which in turn is followed by phelloderm (secondary cortex).

Q. 11 If one debarks a tree, what parts of the plant is being removed?

Thinking Process

Bark is a dead tissue of the plant stem, usually present on dicotyledonous trees.

Ans. Debark means the removal of bark, *i.e.,* all tissue exterior to the vascular cambium, including secondary phloem. Bark refers to a number of tissue types, *viz.,* periderm (phellogen, phellem and phelloderm) and secondary phloem.

Q. 12 The cross-section of a plant material showed the following features when viewed under the microscope.

(a) The vascular bundles were radially arranged.

(b) Four xylem strands with exarch condition of protoxylem.

To which organ should it be assigned?

Ans. Root is the organ which shows the features given in the question. Vascular bundles are present on separate radii thus called radial arrangement. Protoxylem is towards periphery of root thus making exarch condition.

Q. 13 What do hardwood and softwood stand for?

Thinking Process

Wood is secondary xylem. It is formed as a result of secondary growth in gymnosperms and dicotyledonous angiosperms.

Ans. *Distinguish between softwood and hardwood is as*

Softwood	Hardwood
Gymnospermic wood is soft wood	Angiospermic wood is hard wood
It chiefly contains trachieds	It chiefly contain both trachieds and vessels
Vessels are absent.	Trachieds are absent.

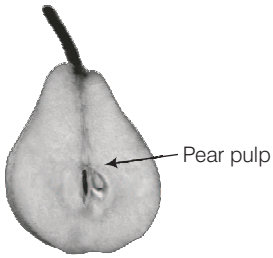
Short Answer Type Questions

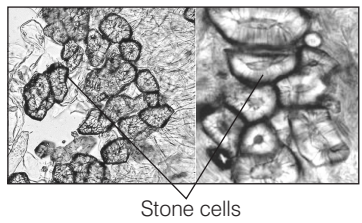
Q. 1 While eating peach or pear it is usually seen that some stone like structures get entangled in the teeth, what are these stone like structures called?

Thinking Process

The peach or pear is a pome fruit. The fleshy thalamus is the edible part of the fruit.

Ans. The pulpy part of fruit of peach and pear, the stone cells are present, which are an sclerenchymatous cells and which are dead in nature. Their function is to give mechanical support to the soft tissue.





Q. 2 What is the commercial source of cork? How is it formed in the plant?

Ans. The commerical cork is obtained from the cork tissue of *Quercus suber*, which yields bottle cork. Cork is formed by cork cambium or phellogen cell. Cork cambium cells divide periclinally, cutting cells towards the inside and outside. The cells cut off twowards the outside become suberised and dead.

These are compactly packed in radial rows without intercellullar spaces and form cork of phellem. Cork is impervious to water due to suberin and provides protection to the underlying tissues.

Q. 3 Below is a list of plant fibres. From which part of the plant these are obtained

(a) coir (b) hemp (c) cotton (d) jute

Ans. (a) **Coir** It is a natural fibre obtained from husk of coconut. It is the fibrous mesoderm of the coconut fruit *Cocos nucifera*.

(b) **Hemp** The fibre is obtained from the stems of *Cannabis sativa*. It is the bast fibre (soft or stem fibre) obtained from secondary phloem.

(c) **Cotton** The fibre is the epidermal growth of cotton (*Gossypium hirsutum*) seed. It is elongated structure made up of cellulose.

(d) **Jute** It is a natural bast fibre obtained from *Corchorus capsularis* and made up of cellulose and lignin.

Q. 4 What are the characteristic differences found in the vascular tissue of gymnosperms and angiosperms?

Thinking Process

Vascular tissue is a complex tissue made up of more than one type of cells. In gymnosperms, it is in primitive form and is advanced in angiosperms.

Ans. *Difference between gymnosperm and angiosperm is as follows*

Gymnosperm	Angiosperm
Gymnosperms lacks vessels in their xylem.	Vessels present in the xylem.
Phloem lacks companion cells.	Phloem possesses companion cells.

Q. 5 Epidermal cells are often modified to perform specialised functions in plants. Name some of them and function they perform.

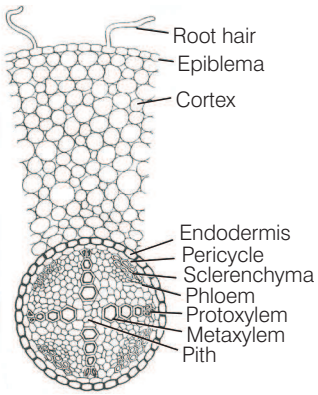
Thinking Process

The epidermal tissue system forms the outer most covering of the whole plant body and comprises of one cell thick layer of epidermal tissue.

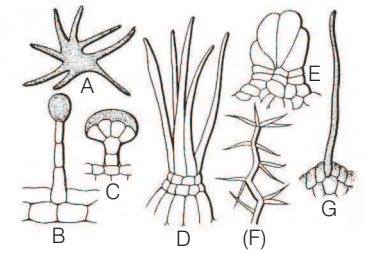
Ans. **Modification of Epidermal Cells**

The epidermal tissue has the following modifications

(i) **Root hair**

Structure	Function
Unicellular hairs are the extensions of epidermal cell of roots in the root hair zone. 	It increases the surface area for absorption of water and minerals.

(ii) **Epidermal Appendages**

Structure	Function
These are called trichomes and are epidermal cell modifications. There may be unicellular or multicellular.  **Appendages of epidermis of leaves** A- Stellate hair of a *Alyssum* B- Glandular hair of *Pelargonium* C- Short glandular hair of *Lavandula* D- Floccose hair of *Malva* E- Glandular hair of *Solanum* F- Urtivating hair of *Verbascum*	Some performs for stinging produces and some glandular secretions.

Q. 6 The lawn grass (*Cyandon dactylon*) needs to be mowed frequently to prevent its overgrowth. Which tissue is responsible for its rapid growth?

Thinking Process

Lawn grass is a runner stem modification of the family–Poaceae. It grows beautifully on the surface of the soil, thus covering entire soil surface, so, it is grown for landscaping in gardens.

Ans. The meristematic tissue is responsible for the rapid growth of such mowed lawn grass. When the apex of grass is cut frequently, it leads to the growth of the lateral branches, that makes it more bushy.

Q. 7 Plants require water for their survival. But when watered excessively, plants die. Discuss.

Thinking Process

Water is a need of every living being (all unicellular or multicellular organisms). So water is called 'Elixir of life'.

Ans. Plants use water for several metabolic process as photosynthesis, transpiration and respiration. Plants die when watered in excess, because excess water removes the air trapped between the soil particles.

So, plant roots do not get O_2 for respiration. Once root cells die, water and mineral absorption is stopped and this leads to gradual death of a plant.

Q. 8 A transverse section of the trunk of a tree shows concentric rings which are known as growth rings. How are these rings formed? What is the significance of these rings?

Thinking Process

A tree grows in the height as well as width. The growth of width of a tree is a characteristic growth pattern resulted due to the activity of lateral meristematic tissues in dicot plants.

Ans. **Concentric Rings** The concentric growth rings are called annual rings. These rings are formed due to the secondary growth. Secondary growth occurs in dicot trees due to the activity of cambium which is a meristematic tissue.

The rate of activity of cambium is more in spring so wood formed has larger wider xylem cells, whereas wood formed in winter has narrower and smaller xylem elements. This results in the formation of two rings called growth rings.

By counting these rings, age of the tree can be determined. This branch of science is known as dendrochronology or growth ring analysis.

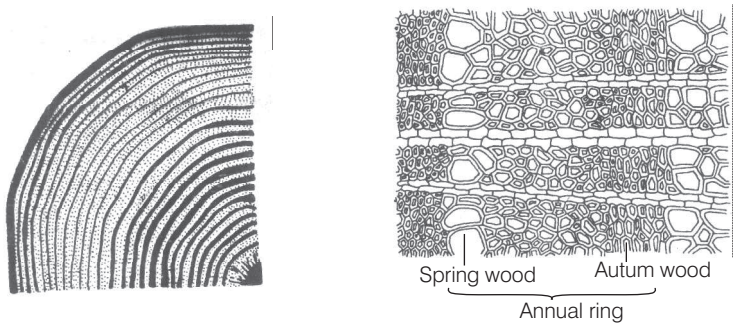


Diagram representing annual rings in an old stem

Q. 9 Trunks of some of the aged tree species appear to be composed of several fused trunks. Is it a physiological or anatomical abnormality? Explain in detail.

Ans. It is anatomical abnormality. It is an abnormal type of secondary growth, where a regular vascular cambium or cork cambium is not formed in its normal position. In case of old tree trunks, anomalous secondary growth produces cortical and medullary vascular bundles.

Thus, the additional or accessory vascular bundles given appearance of several fused trunks.

Q. 10 What is the difference between lenticels and stomata?

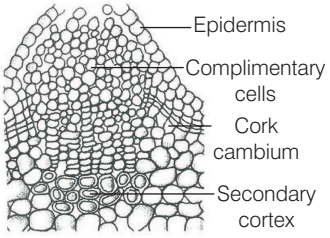
Thinking Process

The gaseous exchange mainly O_2 and CO_2 is the need of all plants. This occurs by means of several openings present in the plant body.

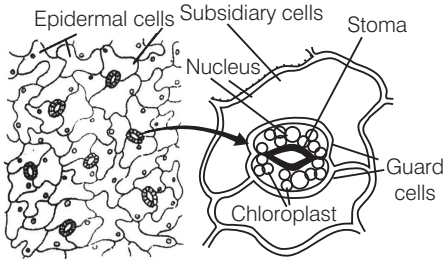
Ans. *Difference between lenticels and stomata is as follows*

Lenticels	Stomata
Lenticels are formed due to loosening of the epidermal and cortical tissues.	Stomata are specialised epidermal structure.
These are mostly found on the stem region. Lenticels does not have guard cells.	Mostly found on lower surface of leaves. Stoma has guard cells.

Lenticels	Stomata
These openings are not regulated. They are used for removal of waste.	Opening and closing is regulated mechanism. They are involved in gaseous exchange, removal of extra water and waste.



Lenticels



Stomata

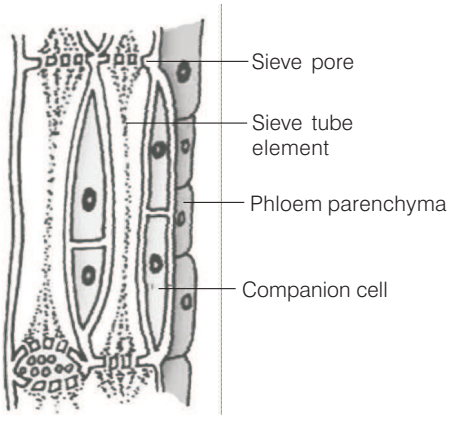
Q. 11 Write the precise function of

(a) sieve tube (b) interfascicular cambium

(c) collenchyma (d) aerenchyma

Ans. **Sieve tube**

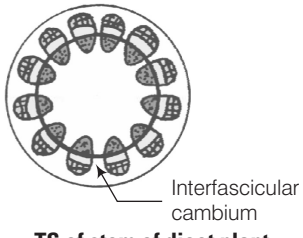
It is present in the phloem tissue. It's function is the transportation of synthesised food through out the plant.



Structure of phloem tissue

Interfascicular Cambium

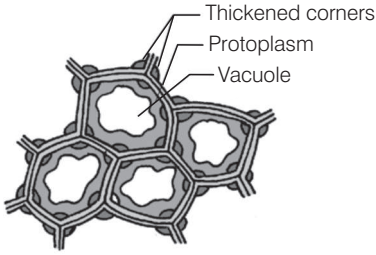
It's function is to bring about secondary growth in the dicot stem and root. It is a kind of secondary meristematic tissue present in between two vascular bundles.



TS of stem of dicot plant

Collenchyma

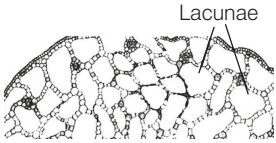
It's function is to provide mechanical support to young growing herbaceous stem. It's cells have angular thickening at corners.



Collenchyma cells

Aerenchyma

It provides buyoncy to the hydrophytic plants. It is a specialised parenchyma having large air spaces.



Aerenchyma cells

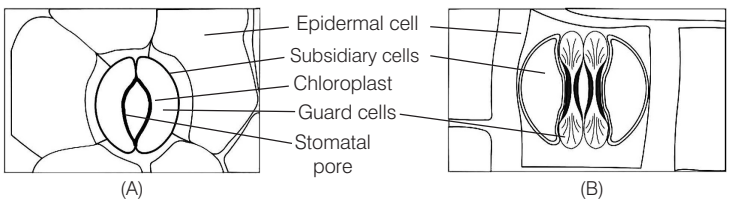
Q. 12 The stomatal pore is guarded by two kidney shaped guard cells. Name the epidermal cells surrounding the guard cells. How does a guard cell differ from an epidermal cell? Use a diagram to illustrate your answer.

Thinking Process

Stomatal apparatus is a special modification of epidermal tissue present over leaf area.

Ans. The epidermal cells surrounding the guard cells of stomata are called subsidiary cells. *Differences between guard cells and epidermal calls are*

Guard cells	Epidermal cells
They are bean or kidney shaped.	They are barrel shaped.
They possess chloroplasts.	They ladk chloroplasts.
They are smaller.	They are bigger.
Cell walls of guard cells are not uniform and thicker.	Epidermal cells are uniformly thin.



Diagrammatic representation (A) stomata with bean-shaped guard cells (B) stomata with dumb-bell shaped guard

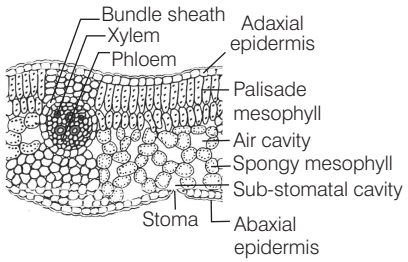
Q. 13 Point out the differences in the anatomy of leaf of peepal (*Ficus religiosa*) and maize (*Zea mays*). Draw the diagrams and label the differences.

Thinking Process

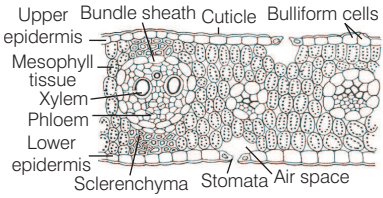
Peepal is a dicot plant so will show the characteristic feature of dorsiventral leaf whereas maize is monocotyledonous, so leaf will be of isobilateral type. Discuss the anatomical features of both leaves by comparing different tissues like epidermis, stomata, vascular bundles etc.

Ans. *Difference between Ficus leaf and maize leaf is as follows*

Character	***Ficus* leaf** (Dicot Leaf)	**Maize leaf** (Monocot Leaf)
Type of leaf	Dorsiventral.	Isobilateral.
Stomata	Usually more on lower epidermis	Equal on both, lower and upper epidermis.
Mesophyll	Made up of two types of tissues (a) Lower spongy parenchyma with large intercellular spaces. (b) Upper palisade parenchyma.	Only spongy parenchyma is present which has very small intercellular spaces.
Bundle sheath	Made up of parenchyma. Just above and below the vascular bundle some parenchymatous cells or collenchymatous cells are present (up to epidermis).	Made of parenchyma, but just above and below, the vascular bundles are found sclerenchymatous cells (up to epidermis).
Bulliform cells	Absent in dicot leaves.	Present, particularly in grasses (monocot leaves).



Dicot leaf



Monocot leaf

Q. 14 Palm is a monocotyledonous plant, yet it increases in girth. Why and how?

Ans. Palms, despite being monocotylednous plant show secondary growth, *i.e.,* increase in girth. This is due to the division and enlargement of parenchymatous cells in the ground tissue. Thus, repeated divisions cause increase in girth of stem and this type of growth is referred to as diffused secondary growth.

Long Answer Type Questions

Q. 1 The arrangement of ovules within the ovary is known as placentation. What does the term placenta refer to? Draw various types of placentations in the flower as seen in TS and VS.

Thinking Process

Presence of ovule is a characteristic feature of all angiosperms. It shows great variation in its attachment to the ovary.

Ans. Placenta are soft cushion like tissues with which the ovules are attached to the inner surface of ovary wall.

The arrangement of ovules within the ovary is known as placentation. The placentations are of different types, *i.e.,* marginal, axile, parietal, basal and free central.

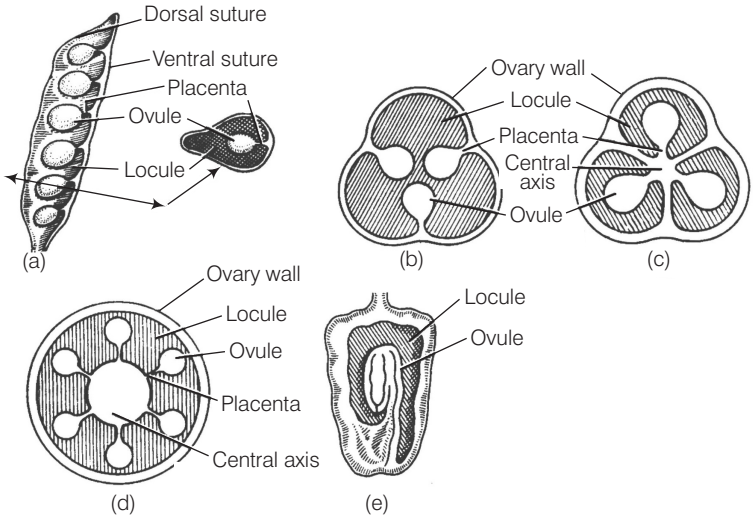
Marginal Placentation In this placentation, the placenta forms a ridge along the ventral suture of the ovary and the ovules are borne on this ridge forming two rows, as in pea.

Axile Placentation In this placentation, the ovules are borne on central axis and the marginal of placenta grow in word and fuse, thus making a multilocular ovary, as in China rose, tomato, etc.

Parietal Placentation In this placentation, the ovules develop on the inner wall of the ovary or on peripheral part. Ovary is one chambered but it becomes two chambered due to the formation of a false septum known as replam, *e.g.,* mustard.

Free Central Placentation In this type of placentation, the ovules are present on the central axis of ovary and septa is absent so ovary is unilocular, as in *Dianthus* and *Primose*.

Basal Placentation In this placentation, the placenta develops at the base of ovary and a single ovule is attached to it, as in sunflower.



Types of placentation : (a) Marginal (b) Axile (c) Parietal (d) Free central and (e) Basal

Q. 2 Deciduous plants shed their leaves during hot summer or in autumn. This process of shedding of leaves is called abscission. Apart from physiological changes what anatomical mechanism is involved in the abscission of leaves.

Thinking Process

Deciduous means 'tending to fall off'. Leaves take up energy to maintain essential process for any plant. During peak hot summer/winter (adverse conditions) plants have to save energy to survive. So, they shed their leaves to conserve energy.

Ans. The process of shedding of leaves during hot summer or in autumn by deciduous plants is known as abscission. Anatomically, the cells of abscission zone are thin-walled and without deposition of lignin or suberin.

At the time of abscission, the middle lamella may dissolve between the cells of two middle layers but the primary wall remain intact. The middle lamella as well as the primary walls of the adjacent cells is dissolved. Ultimately the whole cells of middle layer found in the abscission layer gets dissolve completely.

Thus, there is separation of plant organ, *i.e.,* leaf from the plant, wherever there is rainfall or wind.

Q. 3 Is *Pinus* an evergreen tree? Comment.

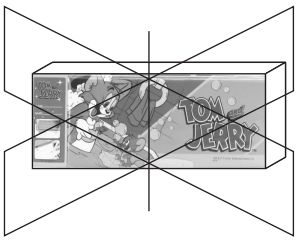
Ans. Evergreen plant are those which has leaves persistent in all the four seasons. In contrast to deciduous plants which completely loose their foliage during winter or dry season. *Pinus* belonging to gymnosperms is an evergeen tree. The flowering plants under conditions of extreme cold shed their leaves and become dormant.

But *Pinus* due to the presence of bark, which is thick, needle-like leaves having sunken stomata, reduce the rate of transpiration. The cold areas are both physiologically and physically dry due to scanty rainfall, precipitation as snow, decreased root absorption at low temperature and exposed habitats.

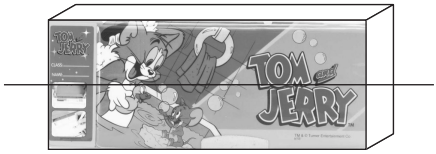
But, *Pinus* is well adapted to such conditions. It continues to manufacture food during this period and grown to dominate other plants. This show that *Pinus* is an evergreen tree. It do not shed its leaves, *i.e.,* needles under any condition.

Q. 4 Assume that a pencil box held in your hand, represents a plant cell. In how many possible planes can it be cut? Indicate these cuts with the help of line drawings.

Ans. **A.** If a plant cell is cut in different plane if result, in radial symmetry.



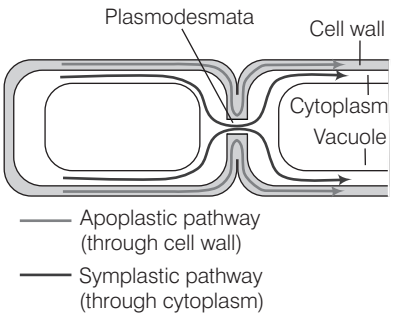
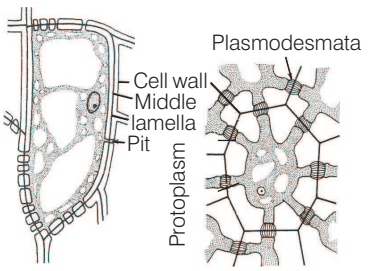
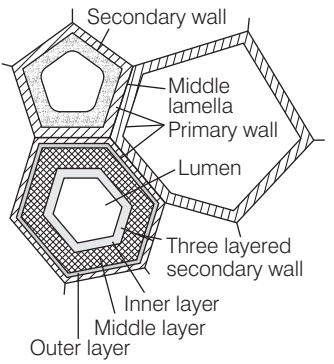
B. If a plant cell is cut in two equal halves it result in bilateral symmetry.



Q. 5 Each of the following terms has some anatomical significance. What do these terms mean? Explain with the help of line diagrams.

(a) Plasmadesmoses/Plasmodesmata
(b) Middle lamella
(c) Secondary wall

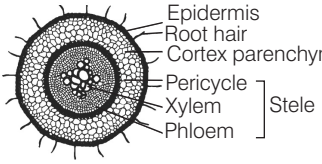
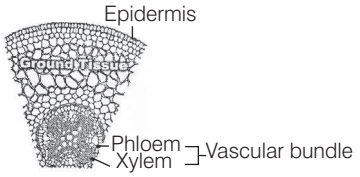
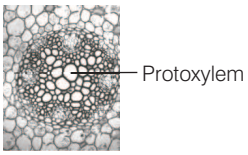
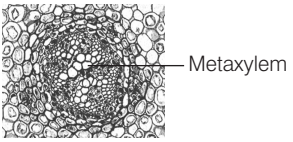
Ans. *These terms mean as listed*

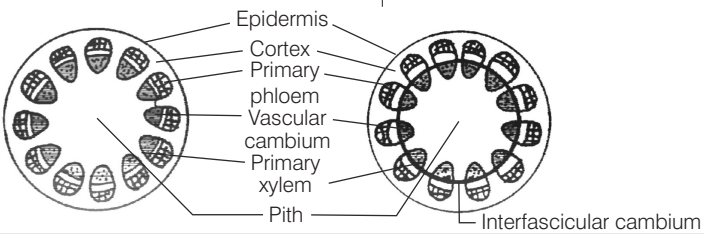
Structure	Function	Diagram
Plasmodesmata These are microscopic connecting channels between the two cells through the cell wall.	Allow communication and transport between two neighbouring cells. Plasmodesmata allow molecules to travel between plant cells through the symplastic pathway.	
Middle lamella It is a layer in the cell wall mainly made of calcium pectate.	Performs the function of cementing between the two neighbouring cells.	
Secondary wall It is a non-extensible layer made of hemicellulose fibres, in the cell wall of plant cells.	Provides rigidity to the cell wall in plant cell.	

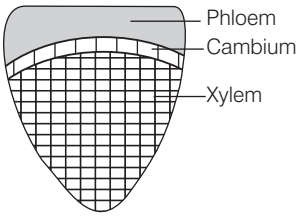
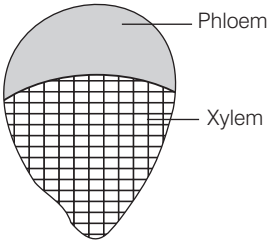
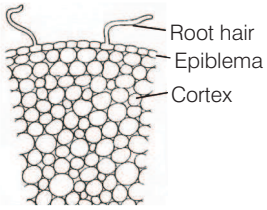
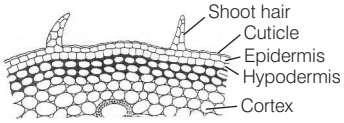
Q. 6 Distinguish between the following.

(a) Exarch and endarch condition of protoxylem
(b) Stele and vascular bundle
(c) Protoxylem and metaxylem
(d) Interfascicular cambium and intrafascicular cambium
(e) Open and closed vascular bundles
(f) Stem hair and root hair

Ans. *Differences between the following*

(a)	**Exarch Protoxylem**	**Endarch Protoxylem**
	When the protoxylem is present towards the periphery and metaxylem towards centre in vascular bundle as it is found in roots.	If the protoxylem is present towards the centre and metaxylem towards periphery in the vascular bundle as it is found in stem.
(b)	**Stele**	**Vascular Bundle**
	Stele refers to conducting tissue or the central part of root or stem in plants. It comprises of vascular tissue, ground tisssue and pith and limiting boundaries, *i.e.,* endodermis and pericycle. 	Vascular bundle comprises of vascular/conducting tissues xylem and phloem. Some times cambium is also included as in dicots. 
(c)	**Protoxylem**	**Metaxylem**
	It is the first or earlier formed xylem. Matures before the gorwth and differentiation of plant organs. Protoxylem elements are smaller in diameter. Tyloses absent in protoxylem vessels. Fibres are absent. 	It is the later formed xylem. Matures after the growth and differentiation of plant organs. Metaxylem delements are broader and greater in diameter. Tyloses are generally present. Fibres may be present. 
(d)	**Intrafascicular Cambium**	**Inter fascicular Cambium**
	Cambium present in between the primary xylem and primary phloem is called-intra fascicular cambium, as in dicot stems.	The cambium present in between the two vascular bundles making the cambium continuous and forming a complete ring of cambium is called interfascicular conbium.



(e)	**Open Vascular Bundle**	**Closed Vascular Bundle**
	Cambium present in between the xylem and phloem tissue. Intrafascicular cambium between the phloem present. Occur in the stems of dicot and gymnosperms. May be collateral or bicolateral. Xylem and phloem not in direct contact with each other due to cambial string. Intrafascicular cambium results in secondary growth. Cambial activity produces secondary phloem and secondary xylem that push primary phloem and primary xylem away from each other.  	Cambium is not present in between the xylem and phloem tissue. Intrafascicular cambium absent. Occur in leaves and monocot stems. May be collateral or concentric. Xylem and phloem are in direct contact due to back of cambial string. No such activity found. No such activity found. 
(f)	**Root Hair**	**Stem Hair**
	Root hairs are unicellular  It increase the surface area of root for absorption of water and minerals.	Stem hairs are multicellular  They are epidermal outgrowths known as trichomes. They help in preventing water loss due to transpiration.