

NCERT Exemplar Solutions of Class 11 Biology – Chapter 6: Anatomy of Flowering Plants
VERY SHORT ANSWER TYPE QUESTIONS

Question 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?

Solution: Parenchyma cells, which are thin-walled and made up of cellulose, store the products of photosynthesis before being transported or utilized by various parts of the plants.

Enhanced Explanation: Parenchyma cells are the primary storage tissue because:

- Thin cellulosic walls allow easy movement of materials
- Living cells with active metabolism
- Large vacuoles for storage
- Present in various organs (cortex, pith, leaf mesophyll)

Question 2

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

Solution: If the protoxylem lies next to phloem, this type of arrangement of xylem is known as Exarch, which is present in the roots.

Enhanced Explanation:

- Exarch condition: Protoxylem towards periphery, metaxylem towards center
- Found in roots where protoxylem is adjacent to phloem strands
- Endarch condition: Protoxylem towards center (found in stems)

Question 3

What is the function of phloem parenchyma?

Solution: The function of phloem parenchyma is to store food material and other substances like resins, latex, and mucilage, and also help in translocation of foods.

Enhanced Explanation: Phloem parenchyma cells serve multiple functions:

- Storage of starch, proteins, and other organic compounds
- Radial transport of materials
- Storage of secondary metabolites (resins, latex, oils)
- Support and maintenance of sieve elements

Question 4

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

Solution: The cuticle is present on the surface of the leaves which helps the plant prevent loss of water. The cuticle is absent in roots.

Enhanced Explanation: The cuticle is a waxy layer composed of cutin and waxes that:

- Forms a waterproof barrier
- Reduces transpiration
- Protects against pathogens
- Absent in roots as they need to absorb water

Question 5

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

Solution: The epidermal cell modification in plants which prevents water loss is known as Bulliform Cells.

Enhanced Explanation: Bulliform cells are specialized epidermal cells that:

- Are large, empty, colorless cells
- Found mainly in grass leaves
- Help in leaf rolling during water stress
- Reduce exposed surface area to minimize water loss

Question 6

What part of the plant would show the following? a. Radial vascular bundle b. Polyarch xylem c. Well developed pith

Solution: (a) **Radial Vascular bundle** is present in roots. Radial vascular bundle includes xylem and phloem, and these are present in separate radii of the roots.

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

(c) **Well developed pith** is present in dicot stem and monocot roots. Dicot stem and monocot roots have well-developed pith formed of parenchymatous cells with intercellular spaces.

Question 7

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

Solution: The cells that make the leaves curl in plants during water stress are Bulliform cells. The epidermal cell modification in plants which prevents water loss is known as Bulliform Cells.

Enhanced Explanation: During water stress, bulliform cells lose water and shrink, causing the leaf to fold or curl inward, thereby reducing the exposed surface area and minimizing water loss through transpiration.

Question 8

What constitutes the cambial ring?

Solution: Interfascicular cambium and Intrafascicular cambium constitutes cambial ring. It is formed due to the meristematic activity of cambium.

Enhanced Explanation:

- Intrafascicular cambium: Present within vascular bundles
- Interfascicular cambium: Forms between vascular bundles by dedifferentiation
- Together they form a complete ring enabling secondary growth

Question 9

Give one basic functional difference between phellogen and phelloderm?

Solution: The basic functional difference between phellogen and phelloderm is: Phellogen is a meristematic tissue and Phelloderm is a permanent tissue. Phellogen is called Cork Cambium, Phelloderm is called Secondary Cortex.

Enhanced Explanation:

- Phellogen: Active meristematic tissue that produces cork and secondary cortex
- Phelloderm: Mature permanent tissue derived from phellogen, provides storage and support

Question 10

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

Solution: Phellem → Phellogen → Phelloderm

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

Question 11

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

Solution: If one debarks a tree then periderm part (i.e., all tissues exterior to vascular cambium) of the plant is being removed.

Enhanced Explanation: Debarking removes the entire periderm including:

- Cork (phellem)
- Cork cambium (phellogen)
- Secondary cortex (phelloderm)
- Primary phloem and any remaining cortex

Question 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?

Solution: The cross-section is of dicot root. Vascular bundles are present and arranged alternately on separate radii thus called a radial arrangement.

Enhanced Explanation: Key identifying features of dicot root:

- Radial arrangement of vascular bundles
- Exarch xylem (protoxylem towards periphery)

- Limited number of xylem strands (2-6 in dicots)
- Alternating xylem and phloem strands

Question 13

What do hardwood and softwood stand for?

Solution: Hardwood is wood from an angiosperm, whereas softwood is wood from gymnosperm.

Enhanced Explanation:

- Hardwood: Angiosperm wood with vessels, complex structure, generally denser
- Softwood: Gymnosperm wood without vessels, simpler structure with tracheids
- The terms don't always reflect actual hardness (balsa is hardwood but soft)

SHORT ANSWER TYPE QUESTIONS

Question 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?

Solution: The stone-like structures present in peach or pear are stone cells also known as Sclereids. They are a type of Sclerenchyma which provides mechanical support to organs.

Enhanced Explanation: Sclereids (stone cells) are characterized by:

- Highly thickened lignified walls
- Irregular shapes
- Dead at maturity
- Provide protection and support to soft tissues
- Common in seed coats, nutshells, and fleshy fruits

Question 2

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

Solution: The commercial source of cork is cork tissue of *Quercus suber*. Due to the activity of vascular cambium, the stem continues to increase in girth. Therefore the outer cortical and epidermis layer gets broken to provide new protection it has to be replaced.

Enhanced Explanation: Cork formation process:

1. Secondary growth increases stem girth
2. Original epidermis and cortex rupture
3. Cork cambium (phellogen) develops from cortical cells
4. Cork cambium produces cork cells outward
5. Cork cells become impregnated with suberin, making them waterproof
6. Commercial cork is harvested from *Quercus suber* (Cork Oak)

Question 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

Solution: a. **Coir** is a natural fibre obtained from coconut husk. b. **Hemp** fibre is obtained from the stem of *Cannabis sativa*. c. **Cotton** fibre is obtained from epidermal growth of cotton seeds. d. **Jute** is natural bast fibre obtained from the stem of *Corchorus capsularis*.

Enhanced Explanation:

- Coir: Mesocarp fibres of coconut fruit
- Hemp: Bast fibres from stem phloem
- Cotton: Seed hair fibres (epidermal outgrowths)
- Jute: Bast fibres from stem (phloem fibres)

Question 4

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

Solution: In vascular tissues of gymnosperms, vessels are absent in Xylem instead they have tracheids. Companion cells are absent in phloem instead they have albuminous cells. In vascular tissue of angiosperms, vessels are present in xylem and lack tracheids. Companion cells are present in phloem and they lack albuminous cells.

Enhanced Explanation:

Feature	Gymnosperms	Angiosperms
Xylem	Only tracheids, no vessels	Both tracheids and vessels
Water conduction	Less efficient	More efficient
Phloem	Sieve cells + albuminous cells	Sieve tubes + companion cells
Food transport	Less specialized	Highly specialized
Evolution	Primitive condition	Advanced condition

Question 5

Epidermal cells are often modified to perform specialized functions in plants. Name some of them and the function they perform.

Solution: i. **Root Hair:** It increases the surface area for absorption of water and minerals from the soils

ii. **Trichomes:** They are also known as stem hairs. They help in water loss prevention during transpiration.

iii. **Bulliform cells:** Bulliform cells are present in grasses. They help in closing the stomata under stressful conditions and this prevents water loss.

Enhanced Explanation: Additional epidermal modifications:

- **Guard cells:** Control gas exchange through stomata
- **Subsidiary cells:** Support guard cell function
- **Hydathodes:** Water secretion in leaves

- **Nectaries:** Nectar secretion
- **Stinging hairs:** Defense mechanism (e.g., nettle)

Question 6

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

Solution: Meristematic tissue is responsible for the rapid growth of lawn grass.

Enhanced Explanation: Grasses have intercalary meristems located at the base of leaves and internodes. This allows:

- Continuous growth even after cutting
- Rapid regeneration
- Growth from protected basal regions
- This is why grass continues growing after mowing

Question 7

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

Solution: Anything when goes excessive it will create a harmful cause. When excess water is poured in plants, the water removes the air trapped between the soil particles. They won't get enough oxygen for respiration.

Enhanced Explanation: Excessive watering causes:

1. **Waterlogged soil:** Air spaces filled with water
2. **Reduced oxygen:** Roots cannot respire aerobically
3. **Anaerobic conditions:** Lead to root rot
4. **Nutrient deficiency:** Poor root function affects uptake
5. **Fungal infections:** Wet conditions promote pathogens
6. **Root death:** Eventually kills the entire plant

Question 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?

Solution: The growth rings in the trunk of the tree are formed by cambial ring due to secondary growth. Each ring contains earlywood and latewood. Secondary growth occurs in dicot trees due to the activity of cambium which is a meristematic tissue. The concentric growth rings are called annual rings.

Enhanced Explanation: Formation:

- Spring: Large vessels, thin walls (earlywood/springwood)
- Summer/Fall: Smaller vessels, thick walls (latewood/summerwood)
- Contrast between seasons creates visible rings

Significance:

- **Age determination:** One ring = one year

- **Climate record:** Ring width indicates environmental conditions
- **Wood quality:** Affects timber properties
- **Ecological studies:** Past environmental conditions

Question 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.

Solution: Trunks of some of the aged tree species appear to be composed of several fused trunks. This is an 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.

Enhanced Explanation: This phenomenon involves:

- **Anomalous secondary growth:** Irregular cambium formation
- **Multiple cambial rings:** Form in abnormal positions
- **Fusion of stems:** Mechanical pressure causes adjacent stems to unite
- **Examples:** Banyan, Ficus, some lianas
- **Adaptive significance:** Increased structural support and vascular connections

Question 10

What is the difference between lenticels and stomata?

Solution: **Lenticels** are lens-shaped openings present on the trunk or stem of the tree.

Stomata are bean-shaped openings present on the lower surface of leaves.

Enhanced Explanation:

Feature	Lenticels	Stomata
Location	Bark of stems, roots	Leaves, young stems
Shape	Lens-shaped	Bean/kidney-shaped
Function	Gas exchange in woody parts	Gas exchange, transpiration
Control	Not actively controlled	Controlled by guard cells
Structure	Loose cork cells	Guard cells with pore

Question 11

Write the function of: a. Sieve tube b. Interfascicular cambium

c. Collenchyma d. Aerenchyma

Solution: a. **Sieve tube** – They help in translocation of synthesized food throughout the plant. It is present in phloem tissue.

b. **Interfascicular cambium** – It facilitates secondary growth in dicot stem and root and also helps in the formation of the vascular cambium.

c. **Collenchyma** – It provides mechanical support to young stem. Its cells have angular thickening at corners.

d. **Aerenchyma** – It provides buoyancy to floating plants.

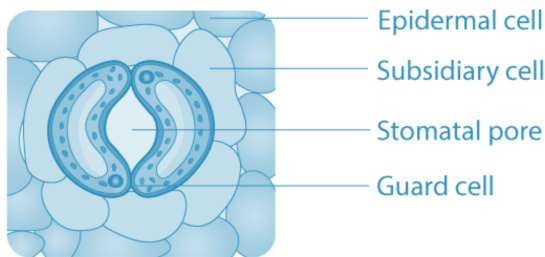
Enhanced Explanation:

- **Sieve tube:** Long-distance sugar transport, works with companion cells
- **Interfascicular cambium:** Forms complete cambial ring by connecting vascular bundles
- **Collenchyma:** Flexible support allowing growth while providing strength
- **Aerenchyma:** Air-filled spaces reduce density and provide oxygen to submerged parts

Question 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.

Solution: Stomata regulate the process of transpiration and gaseous exchange. The epidermal cells surrounding the guard cells are known as **Subsidiary cells**.



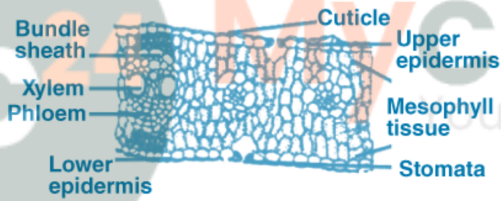
Differences between guard cells and epidermal cells:

Feature	Guard Cells	Epidermal Cells
Shape	Kidney/bean-shaped	Irregular, elongated
Chloroplasts	Present	Absent
Cell wall	Unevenly thickened	Uniformly thin
Function	Control stomatal opening	Protection
Arrangement	Pairs around pore	Continuous layer

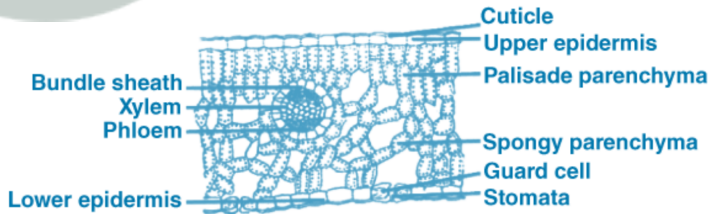
Question 13

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

Solution: **Peepal** is a dorsiventral leaf which is a dicot. Stomata are more on the lower surface and mesophyll is made up of two types of tissues. **Maize** is an isobilateral leaf which is a monocot. Stomata are equal in number on both the surfaces.



T.S of monocot leaf



Enhanced Explanation:

Feature	Peepal (Dicot)	Maize (Monocot)
Leaf type	Dorsiventral	Isobilateral
Mesophyll	Palisade + Spongy	Uniform throughout
Stomata	More on lower surface	Equal on both surfaces
Vascular bundles	Reticulate venation	Parallel venation
Bundle sheath	Not prominent	Prominent (C ₄ plant)

Question 14

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

Solution: Palm is a monocotyledonous plant, yet it increases in girth slowly due to secondary growth. It is due to parenchymatous cell division and enlargement in the ground tissue.

Thus, repeated divisions cause an increase in girth of the stem.

Enhanced Explanation: Palm's girth increase occurs through:

1. **Primary thickening:** Continuous activity of apical meristem
2. **Cell expansion:** Parenchyma cells in ground tissue enlarge
3. **Cell division:** Some parenchyma cells retain meristematic activity
4. **No true secondary growth:** No cambium formation
5. **Slow process:** Much slower than dicot secondary growth