

## NCERT Exemplar Solutions of Class 11 Biology – Chapter 6: Anatomy of Flowering Plants

### LONG ANSWER TYPE QUESTIONS

#### Question 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 T.S. and V.S.

**Solution:** The placenta is a tissue which is flattened, cushion-like tissue. Through the placenta, the ovule is attached to the wall of the ovary. Placentations are of many types like marginal, axile, parietal, basal, central and free central.



#### Enhanced Explanation:

**Placenta:** The tissue that connects ovules to the ovary wall, providing nutrients and vascular connection.

#### Types of Placentation:

1. **Marginal:** Ovules attached to ventral suture (e.g., pea, bean)
2. **Axile:** Ovules attached to central axis in multilocular ovary (e.g., tomato, lemon)
3. **Parietal:** Ovules attached to ovary wall (e.g., mustard, cucumber)
4. **Free Central:** Ovules attached to central column in unilocular ovary (e.g., Dianthus)
5. **Basal:** Single ovule attached to base of ovary (e.g., sunflower, marigold)
6. **Central:** Ovules attached to central axis throughout length

#### Question 2

Deciduous plants shed their leaves during 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?

**Solution: Anatomical mechanisms in leaf abscission:**

- Structural:** In deciduous trees, an abscission zone also known as separation zone is formed at the base of the petiole. It is composed of a top layer and bottom layer. The cells in the top layer have weak cell walls and the bottom layer expand in winter and break the cell walls of the top layer, this results in the shedding of leaves.
- The loss of chlorophyll** may also result in the abscission process.
- Hormonal:** Abscisic acid hormone stimulates abscission.

#### Enhanced Explanation:

##### Abscission Zone Structure:

- **Separation layer:** Small, thin-walled cells with weak middle lamella
- **Protective layer:** Suberized cells that seal the wound after leaf fall

##### Process:

1. Formation of abscission zone at petiole base
2. Enzymatic breakdown of cell walls in separation layer
3. Weakening of vascular connections
4. Physical separation by wind or gravity
5. Protective layer seals the wound

**Hormonal Control:**

- **Auxin decrease:** Reduces cell wall strength
- **Absciscic acid increase:** Promotes enzyme activity
- **Ethylene production:** Triggers abscission

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**Question 3**

Is Pinus an evergreen tree? Comment.

**Solution:** Pinus does not shed its leaves during a particular season and is always evergreen. Hence Pinus is considered as an evergreen tree belongs to gymnosperms. The leaves in gymnosperms can withstand in the extreme temperatures, humidity and wind.

**Enhanced Explanation:**

**Why Pinus is evergreen:**

1. **Needle-shaped leaves:** Reduced surface area minimizes water loss
2. **Thick cuticle:** Waxy coating prevents dehydration
3. **Sunken stomata:** Protected stomata reduce transpiration
4. **Sclerenchymatous tissues:** Provide structural support
5. **Resin ducts:** Protect against pathogens and herbivores

**Adaptive advantages:**

- **Continuous photosynthesis:** No seasonal interruption
- **Reduced energy cost:** No need to replace all leaves annually
- **Cold tolerance:** Needles withstand freezing temperatures
- **Drought resistance:** Efficient water conservation

**Economic importance:**

- Timber production
- Resin and turpentine extraction
- Ornamental purposes
- Soil conservation

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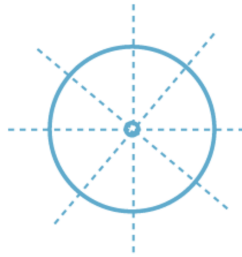
**Question 4**

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.

**Solution:** When any plane passing through the central axis of the plant cell divides the cell into two identical halves called **radial symmetry**.



Bilateral symmetry



Radial symmetry

**Enhanced Explanation:**

**Types of sections possible:**

1. **Transverse Section (T.S.):** Cut perpendicular to the long axis
  - Shows cross-sectional view
  - Most commonly used in plant anatomy
  - Reveals radial arrangement of tissues
2. **Longitudinal Section (L.S.):** Cut parallel to the long axis
  - **Radial Longitudinal Section (R.L.S.):** Through the center
  - **Tangential Longitudinal Section (T.L.S.):** Tangent to the surface

**Symmetry types:**

- **Radial symmetry:** Multiple planes of symmetry through central axis
- **Bilateral symmetry:** Only one plane of symmetry
- **Asymmetrical:** No planes of symmetry

For a cylindrical plant organ (like stem), infinite radial sections are possible through the central axis.

**Question 5**

Each of the following terms has some anatomical significance. What do these terms mean? Explain with the help of line diagrams. a. Plasmodesmata b. Middle lamella c. Secondary wall

**Solution:** a. **Plasmodesmata** – A microscopic channels between two cells through the cell wall are called Plasmodesmata.

b. **Middle lamella** – It is a layer in the cell wall and is made of calcium pectate (mainly) and magnesium pectate.

c. **Secondary wall** – this is a non-extensible layer. It is made of hemicelluloses. It provides rigidity to the cell.

**Enhanced Explanation:**

**Plasmodesmata:**

- **Structure:** Cytoplasmic channels connecting adjacent cells
- **Function:** Allow transport of materials between cells
- **Components:** Plasma membrane-lined channels with desmotubule

- **Significance:** Enables symplastic transport

**Middle Lamella:**

- **Location:** Outermost layer of cell wall between adjacent cells
- **Composition:** Calcium and magnesium pectates
- **Function:** Cements adjacent cells together
- **Formation:** First layer deposited during cell division

**Secondary Wall:**

- **Location:** Inner to primary wall
- **Composition:** Cellulose, hemicellulose, lignin
- **Properties:** Thick, rigid, non-extensible
- **Function:** Provides mechanical strength
- **Deposition:** After cell expansion is complete

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**Question 6**

Distinguish between the following: a. Exarch and endarch 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

**Solution:**

**a. Exarch and Endarch:**

- **Exarch:** Protoxylem towards periphery, metaxylem towards centre (found in roots)
- **Endarch:** Protoxylem towards centre, metaxylem towards periphery (found in stems)

**b. Stele and Vascular Bundle:**

- **Stele:** Central part of root or stem containing all vascular tissues
- **Vascular bundle:** Part of stele containing xylem and phloem together

**c. Protoxylem and Metaxylem:**

- **Protoxylem:** First-formed xylem with smaller, extensible elements
- **Metaxylem:** Later-formed xylem with larger, non-extensible elements

**d. Interfascicular and Intrafascicular Cambium:**

- **Interfascicular cambium:** Between vascular bundles, formed by dedifferentiation
- **Intrafascicular cambium:** Within vascular bundles, between xylem and phloem

**e. Open and Closed Vascular Bundles:**

- **Open:** Contain cambium, capable of secondary growth (dicot stems)
- **Closed:** No cambium, no secondary growth (monocot stems)

**f. Stem Hair and Root Hair:**

- **Stem hair (Trichomes):** Multicellular epidermal outgrowths, various functions
- **Root hair:** Unicellular extensions of epidermal cells, for absorption

**Enhanced Explanation:**

These distinctions are fundamental to understanding plant anatomy and reflect evolutionary adaptations and functional specializations in different plant organs and groups.

<b>Comparison</b>	<b>Structure A</b>	<b>Structure B</b>
<b>Location preference</b>	Roots (Exarch)	Stems (Endarch)
<b>Developmental timing</b>	Early (Proto-)	Late (Meta-)
<b>Growth potential</b>	Open (with growth)	Closed (limited growth)
<b>Structural complexity</b>	Multi-cellular (Stem hair)	Uni-cellular (Root hair)

Understanding these differences helps in:

- Plant identification and classification
- Functional interpretation of plant structures
- Evolutionary relationships between plant groups
- Agricultural and horticultural applications

