CBSE NCERT Solutions for Class 11 Biology Chapter 06

1. State the location and function of different types of meristems.

**Solution:**

The meristematic cells are specialised cells responsible for active cell division, which are accountable for growth in plants.

Plants have different kinds of meristem based on their location.

- **Apical meristem:**
  
  Location: The meristems which occur at the tips of roots and shoots and produce primary tissues are called apical meristems. Since the apical meristems appear early in a plant’s life, they constitute the **primary meristem**.
  
  Function: The shoot apical meristem **elongates the stem** and hence helps to increase the height of plants. The apical root meristem helps in **root elongation**. During the elongation of the stem, some ‘left behind’ cells from shoot apical meristem constitute the axillary bud which is capable of **forming a branch or a flower**.

- **Intercalary meristem:**
  
  Location: It is present **between the masses of mature tissues present at the bases of the leaves of grasses**. Since the intercalary meristems appear early in a plant’s life, they constitute the **primary meristem**.
  
  Function: It helps in the **regeneration of grasses** after herbivores have grazed them.

- **Lateral meristem:**
  
  Location: It appears **in the mature regions of roots and shoots** of plants that produce woody axis. It is **secondary meristem** as it appears later in a plant’s life.
  
  Function: It adds secondary tissues to the plant body, and it increases the girth of plants. Examples include cork cambium, fascicular cambium and interfascicular cambium.
2. Cork cambium forms tissues that form the cork. Do you agree with this statement? Explain.

Solution:

Cork cambium is a type of lateral meristematic tissue which is found in the cortex regions of the mature stem of a plant. Cork cambium forms in plants to replace the broken epidermal layer of the stem. This broken-cut off epidermal layer on the outer side by cork cambium is called cork now.

Therefore, I agree to the statement that cork cambium forms tissues that form the cork.

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

Solution:

The increase in girth of stems of woody angiosperms is called secondary growth. This involves two types of cambia, i.e., cork cambium and vascular cambium.

(i) Vascular Cambium:

Some cells of medullary rays become meristematic and form the interfascicular cambium. The fascicular and the interfascicular cambium join to form a complete ring called cambial ring.

The cambial ring cells undergo mitotic divisions and produce secondary phloem on its outer side while secondary xylem on its inner side.

The vascular cambium possesses ray initials at places. They form vascular rays, phloem rays in secondary phloem and wood rays in secondary xylem.

As new secondary phloem becomes functional, the older phloem gets crushed. But, wood or secondary xylem persist. Consequently, wood grows with age in the form of annual rings.

In the old stems, the central part of wood becomes non-functional and dark coloured due to tyloses and deposit of resins, gums, tannins. It is called duramen or heartwood. The outer functional wood is called sapwood.

(ii) Cork Cambium:
As the stem continues to increase its girth due to the activity of vascular cambium, the outer cortical and epidermal layers get broken and need to be replaced to provide new protective cell layers. As a result, cork cambium or phellogen develops in the cortex region — phellogen cuts off cells on both sides. The outer cells differentiate into cork or phellem, while the inner cells differentiate into secondary cortex or phelloderm.

Significance of Secondary Growth:

i. It replaces old non-functional tissues. The increase in the girth or circumference of stem continues due to the activity of vascular cambium.

ii. It provides fire proof, insect-proof and insulating cover around the older plant parts. It also provides mechanical strength to stem.

iii. Wood is the product of secondary growth. Commercial cork is also a product of secondary growth.
4. Draw illustrations to bring out the anatomical difference between
(a) Monocot root and Dicot root (b) Monocot stem and Dicot stem

\textbf{Solution:}

\begin{tabular}{|l|l|}
\hline
\textbf{Monocot root} & \textbf{Dicot root} \\
\hline
Xylem is polyarchy. & Xylem is usually tetrarch. \\
Pith is usually large in the centre. & Pith is absent. \\
Metaxylem vessels are generally circular in cross-section. & Metaxylem vessels are generally polygonal in cross-section. \\
Conjunctive tissue is sclerenchymatous. & Conjunctive tissue is parenchymatous. \\
There is no secondary growth. & Secondary growth is generally present. \\
\hline
\end{tabular}
### (b)

<table>
<thead>
<tr>
<th>Monocot stem</th>
<th>Dicot stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>The hypodermis is made up of sclerenchymatous cells.</td>
<td>The hypodermis is made up of collenchymatous cells.</td>
</tr>
<tr>
<td>Ground tissue is not differentiated, but it is a</td>
<td>Ground tissue is differentiated into the cortex, pericycle, pith and endodermis.</td>
</tr>
<tr>
<td>continuous mass of parenchyma.</td>
<td></td>
</tr>
<tr>
<td>Pith is absent.</td>
<td>Pith is present.</td>
</tr>
<tr>
<td>The starch sheath is absent.</td>
<td>The starch sheath is present.</td>
</tr>
<tr>
<td>Pericycle is absent.</td>
<td>Pericycle is present.</td>
</tr>
<tr>
<td>Medullary rays are absent.</td>
<td>Medullary rays are present.</td>
</tr>
<tr>
<td>Vascular bundles are closed.</td>
<td>Vascular bundles are open.</td>
</tr>
<tr>
<td>Vascular bundles are scattered in ground tissue.</td>
<td>Vascular bundles are arranged in a ring.</td>
</tr>
<tr>
<td>Bundle sheath is present.</td>
<td>Bundle cap is present.</td>
</tr>
<tr>
<td>Phloem parenchyma is absent.</td>
<td>Phloem parenchyma is present.</td>
</tr>
</tbody>
</table>

(Note: Only the diagrams are required to answer this question. The differences are written for the extra clarity on the concept.)

5. Cut a transverse section of young stem of a plant from your school garden and observe it under the microscope. How would you ascertain whether it is a monocot stem or a dicot stem? Give reasons.

**Solution:**
The dicot stem is characterised by the occurrence of collateral, conjoint, and open vascular bundles with a strip of cambium between the xylem and phloem.

- The vascular bundles are arranged in a ring around the centrally-located pith.
- The ground tissue is differentiated into the parenchyma, collenchyma, endodermis, pith, and pericycle. Medullary rays are found between the vascular bundles.
- Epidermal hairs are present.

Figure: Transverse section of dicot stem (2 marks)

Figure: Transverse section of monocot stem
- The monocot stem is characterised by the occurrence of collateral, conjoint, and closed vascular bundles scattered in the ground tissue containing the parenchyma.
- The sclerenchymatous bundle-sheath cells surround each vascular bundle.
- Phloem parenchyma and medullary rays are absent, and water-containing cavities are present in monocot stem.
- Epidermal hairs are absent.

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

Solution:

The monocot stem: It is characterised by the occurrence of collateral, conjoint, and closed vascular bundles scattered in the ground tissue containing the parenchyma. The sclerenchymatous bundle-sheath cells surround each vascular bundle. Phloem parenchyma and medullary rays are absent, and water-containing cavities are present in monocot stem.

7. Why are xylem and phloem called complex tissues?

Solution:

- Xylem and phloem are complex tissues of plants as they are made up of more than one type of cells. These cells work as a unit in a coordinated manner to perform the several functions of the xylem and phloem.
- Xylem helps in conduction of water and minerals. It also gives mechanical support to plants. Xylem is made up of the following components: Tracheids (xylem vessels and xylem tracheids), Xylem parenchyma, Xylem fibres.
  - Tracheids are elongated, thick-walled dead cells with the pointed ends.
Vessels are tubular, long, and cylindrical structures. Both tracheids and vessels have lignified walls and large central cavities, and both lack protoplasm.

Xylem fibres contain thick walls with a nearly unimportant lumen. They help in providing mechanical support to the plants.

Xylem parenchyma is made up of thin-walled parenchymatous cells and help in the storage of food materials and in the radial conduction of water.

Phloem helps in conducting food materials. Phloem consists of Sieve tube elements, Companion cells, Phloem parenchyma, Phloem fibres.

Sieve tube elements are tube-like elongated structures attached to companion cells. The end walls of sieve tube elements are perforated to form the sieve plate. Sieve tube elements are living cells containing cytoplasm and nucleus.

Companion cells are parenchymatous. They help in maintaining the pressure gradient in the sieve tube elements.

Phloem parenchyma storages the food and is made up of long tapering cells, with dense cytoplasm.

Phloem fibres are elongated sclerenchymatous cells with thick cell walls.

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

Solution:

Stomata are tiny pores present in the epidermis of leaves. Stomatal apparatus is made up of two guard cells, subsidiary cells, and stomatal aperture. They regulate the process of transpiration and gaseous exchange.

The **stomatal pore** is surrounded by two bean-shaped **guard cells**. The guard cells are dumb-bell shaped in grasses. The inner walls of guard cells are thick, and the outer walls are thin. The guard cells possess chloroplasts and regulate the closing and opening of stomata.

The **subsidiary cells** surround guard cells. They are the specialised epidermal cells present around the guard cells. The pores, the guard cells, and the subsidiary cells together constitute the stomatal apparatus.
9. Name the three basic tissue systems in the flowering plants. Give the tissue names under each system.

Solution:

Based on structure and location, the three basic tissue systems in the flowering plants are tabulated below:

<table>
<thead>
<tr>
<th>Tissue system</th>
<th>Tissues present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermal tissue system</td>
<td>Epidermis, trichomes, hairs, stomata</td>
</tr>
<tr>
<td>Ground tissue system</td>
<td>Parenchyma, collenchyma, sclerenchyma, mesophyll</td>
</tr>
<tr>
<td>Vascular tissue system</td>
<td>Xylem, phloem, cambium</td>
</tr>
</tbody>
</table>

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

Solution:

Plants are our lifeline as they provide the oxygen we breathe, the food we eat, the wood we get to make our shelters, medicines, and many commercial plant products. Hence, plant anatomy will allow us to better understand how plants function for their survival which in turn has allowed us to respect plants and their importance in the ecosystem.
It also helps us to distinguish between monocots, dicots, and gymnosperms. Such a study is linked to plant physiology. Hence, it helps in the crop improvements for food.

Additionally, the study of plant anatomy benefits us to understand the structural adaptations of plants relating to diverse environmental conditions.

The study of various plant fibres such as jute, flax, etc., helps in their commercial exploitation.

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

**Solution:**

The phellogen, phellem, and phelloderm are collectively called periderm.

The meristematic tissue that develops to replace the worn out epidermis of dicot stem is called phellogen or cork cambium.

**Phellogen** cuts off cells on both the sides. The outer cells differentiate to become **phellem** or **cork**. The phellem or cork is impermeable to water as there are suberine deposits in its cell wall.

The inner cells differentiate to become **phelloderm** or **secondary cortex**. The cells of the secondary cortex are parenchymatous.

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

**Solution:**

The dorsiventral leaves are found in dicot plants. The vertical section of a dorsiventral leaf contains three diverse parts:

1. **Epidermis:** It is present on both the lower surface (abaxial epidermis) and the upper surface (adaxial epidermis). The outside of the epidermis is covered with a thick cuticle. The abaxial epidermis has more stomata than the adaxial epidermis.

2. **Mesophyll:** It is a tissue of the leaf present between the abaxial and adaxial epidermis. It is differentiated into the spongy parenchyma (comprising oval or round, loosely-arranged cells with intercellular spaces) and palisade parenchyma...
Anatomy of Flowering Plants

(composed of tall, compactly-placed cells). Mesophyll comprises the chloroplasts which perform photosynthesis.

3. **Vascular system:** The vascular bundles present in leaves are closed and conjoint. Thick layers of bundle-sheath cells surround the vascular bundles.

![Anatomy of dicot leaf](image-url)