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| **INDIAN SCHOOL AL WADI AL KABIR** | | |
| **Class: XI** | **Department: SCIENCE 2025-2026**<br>**SUBJECT: BIOLOGY** | **Date: 21/10/2025** |
| **Worksheet: 11** | **UNIT – Structural Organisation in Plants and Animals**<br>**CHAPTER: Anatomy of flowering plants** | **Note:**<br>**A4 FILE FORMAT** |
| **CLASS & SEC:** | **NAME OF THE STUDENT:** | **ROLL NO.** |

**I. OBJECTIVE TYPE QUESTIONS:**

1.Find the statement that is NOT correct about the structure of the monocot stem.

A. Vascular bundles are conjoint and closed.
B. Phloem parenchyma is absent.
C. Hypodermis is parenchymatous.
D. Vascular bundles are scattered.

**2.** Bulliform cells are responsible for:

A. Inward curling of leaves in monocots.
B. Protecting the plant from tall stress.
C. Increased photosynthesis in monocots.
D. Providing large spaces for storage of sugars.

3. Arrange them in the correct sequence, starting from the periphery to the centre:

a. Endodermis
b. Pith
c. Epidermis
d. Pericycle
e. Cortex

Choose the correct answer from the options given below:

A. d, c, e, a, b
B. a, c, e, b, d
C. c, e, a, d, b
D. c, e, d, b, a

4. Which among the following statements are applicable to the vascular bundle of monocot stem?

(i) Cambium is present between xylem and phloem, open condition
(ii) Cambium is absent between xylem and phloem, closed condition
(iii) Xylem and phloem are situated in the same bundles, conjoint condition
(iv) Xylem and phloem are situated in different bundles, radial condition

A. Both (ii) and (iii)
B. Both (i) and (iii)
C. Both (ii) and (iv)

D. Both (i) and (iv)

5. The tangential as well as radial walls of the endodermal cells have a deposition of water impermeable, waxy material _____in the form of casparian strips:
   A. Pectin
   B. Suberin
   C. Cutin
   D. Cellulose

Two statements are given - one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
C. Assertion (A) is true, but Reason (R) is false.
D. Assertion (A) is false, but Reason (R) is true.

6. **Assertion (A):** In a dorsiventral leaf, the abaxial epidermis typically has more stomata than the adaxial epidermis.
   **Reason (R):** The adaxial epidermis is usually exposed to more direct sunlight, and having fewer stomata reduces water loss through transpiration.
7. **Assertion (A):** The mesophyll of a dorsiventral leaf is made up of parenchyma and is differentiated into two types: palisade and spongy parenchyma.
   **Reason (R):** The palisade parenchyma consists of elongated cells arranged adaxially, while the spongy parenchyma has irregularly arranged cells with large air spaces, which is characteristic of isobilateral leaves.

## II. VERY SHORT ANSWER TYPE QUESTIONS(2M)

8. Differentiate between open and closed vascular bundles.
9. What is stomatal apparatus?
10. What are bulliform cells, and what is their function?

## III. SHORT ANSWER TYPE QUESTIONS (3M)

11. Give a comparative account of
    (i) Dicot and monocot roots
    (ii) Dicot stem and monocot stem
12. Distinguish between:
    (i) Exarch and endarch condition
    (ii) Metaxylem and protoxylem
13. Draw illustrations to bring out the anatomical difference between monocot root and dicot root.

## IV. CASE STUDY BASED QUESTIONS (4M)

The epidermal tissue system covers the plant body, consisting of epidermal cells, stomata, and hairs. Epidermal cells form a compact, protective layer with a waxy cuticle that prevents water loss, except in roots. Stomata, enclosed by guard cells, regulate gas exchange and transpiration. Root hairs and shoot trichomes are epidermal appendages for absorption and protection, respectively.

A. What is the function of the cuticle and why is it absent in roots?
B. Differentiate between root hairs and trichomes.
C. How do guard cells regulate stomatal opening and closing?
D. Briefly explain epidermal tissue.

## V. LONG ANSWER TYPE QUESTIONS (5M)

14. Give a comparative account of the internal structure of a dicot and a monocot leaf. In your answer, include the arrangement of stomata, mesophyll differentiation, and the organisation of vascular bundles.

15. (i) How is the study of plant anatomy useful to us?

(ii) Name the three basic tissue systems in the flowering plants. Give the tissue names under names under each system.

<table>
<tr><th>S.NO</th><th>ANSWERS</th></tr>
<tr><td>1.</td><td>C. Hypodermis is parenchymatous</td></tr>
<tr><td>2.</td><td>A. Inward curling of leaves in monocots.</td></tr>
<tr><td>3.</td><td>C. c, e, a, d, b</td></tr>
<tr><td>4.</td><td>A. Both (ii) and (iii)</td></tr>
<tr><td>5.</td><td>B. Suberin</td></tr>
<tr><td>6.</td><td>A. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).</td></tr>
<tr><td>7.</td><td>C. Assertion (A) is true, but Reason (R) is false.</td></tr>
<tr><td>II</td><td>VERY SHORT ANSWER TYPE QUESTIONS(2M)</td></tr>
<tr><td>8.</td><td>
<table>
<tr><td>Feature</td><td>Open Vascular Bundles</td><td>Closed Vascular Bundles</td></tr>
<tr><td>Cambium</td><td>A layer of cambium is present between the xylem and phloem.</td><td>Cambium is absent.</td></tr>
<tr><td>Secondary Growth</td><td>Due to the presence of cambium, they have the ability to form secondary xylem and phloem, resulting in an increase in the girth of the stem.</td><td>They do not possess a cambium layer, so they cannot undergo secondary growth.</td></tr>
<tr><td>Occurrence</td><td>They are a characteristic feature of dicotyledonous stems.</td><td>They are typically found in monocotyledonous stems.</td></tr>
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</td></tr>
<tr><td>9.</td><td>The stomatal apparatus is the structure in the epidermis of leaves that regulates gas exchange and transpiration. It is composed of three parts working together:<ul><li>Stomatal pore (aperture): The opening for gas and water vapor exchange.</li><li>Guard cells: A pair of specialized cells that surround the stomatal pore.</li><li>Subsidiary cells: Epidermal cells near the guard cells that have specialized shape and size.</li></ul></td></tr>
<tr><td>10.</td><td>Bulliform cells are large, empty, and colourless epidermal cells found in the leaves of monocots, particularly grasses. During water stress, these cells lose turgor and cause the leaves to roll inwards, which helps to reduce water loss through transpiration.</td></tr>
<tr><td>III</td><td>SHORT ANSWER TYPE QUESTIONS (3M)</td></tr>
<tr><td>11.</td><td>(i)
<table>
<tr><td>Feature</td><td>Dicot Root</td><td>Monocot Root</td></tr>
<tr><td>Vascular Bundles</td><td>Fewer in number, typically 2 to 6 (diarch to hexarch).</td><td>More in number, usually more than 6 (polyarch).</td></tr>
<tr><td>Pith</td><td>Small or inconspicuous, sometimes absent.</td><td>Large, well-developed, and prominent.</td></tr>
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| | **Secondary Growth** | Undergoes secondary growth due to the presence of cambium. | Does not undergo secondary growth because cambium is absent. |

(ii)

| Feature | Dicot Stem | Monocot Stem |
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| **Vascular Bundles** | Arranged in a ring, open (cambium present). | Scattered throughout the ground tissue, closed (cambium absent). |
| **Ground Tissue** | Differentiated into cortex, endodermis, pericycle, and pith. | Not differentiated; the entire mass of tissue is called ground tissue. |
| **Secondary Growth** | Typically undergoes secondary growth, leading to an increase in girth. | Secondary growth is absent due to the lack of vascular cambium. |

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| **12.** | (i) exarch – protoxylem facing towards outside, endarch – protoxylem towards inside<br>(ii) Metaxylem – later formed xylem vessels, protoxylem – first formed xylem vessels, size difference; |
| **13.** | NCERT TEXTBOOK Figure 6.3 T.S.: (a) Dicot root (Primary) (b) Monocot root |
| **IV** | **CASE STUDY BASED QUESTIONS (4M)** |
| **A.** | The cuticle is a waxy layer on the epidermis that prevents water loss. It is absent in roots because roots need to absorb water and minerals from the soil, a function that the waxy cuticle would inhibit. |
| **B.** | Root hairs are unicellular elongations of root epidermal cells that help absorb water and minerals. Trichomes are epidermal hairs on the shoot system, which can be multicellular, branched, or unbranched, and primarily help prevent water loss. |
| **C.** | Guard cells possess chloroplasts and their inner walls are highly thickened compared to their thinner outer walls. Turgor pressure changes within the guard cells, regulated by the movement of water and ions, cause them to change shape, thereby controlling the opening and closing of the stomatal pore. |
| **D.** | The epidermal tissue system forms the outer-most covering of the whole plant body and comprises epidermal cells, stomata and the epidermal appendages – the trichomes and hairs. The epidermis is the outermost layer of the primary plant body. It is made up of elongated, compactly arranged cells, which form a continuous layer. Epidermis is usually single layered. Epidermal cells are parenchymatous with a small amount of cytoplasm lining the cell wall and a large vacuole. |
| **V** | **LONG ANSWER TYPE QUESTIONS (5M)** |
| **14.** | Dicot Leaf (Dorsiventral): Stomata are generally more numerous on the lower (abaxial) epidermis to minimize water loss from direct sunlight. The upper (adaxial) epidermis may have fewer stomata or lack them entirely.<br>Monocot Leaf (Isobilateral): Stomata are present in approximately equal numbers on both the upper and lower surfaces, as both sides receive equal illumination.<br>Dicot Leaf: The mesophyll is differentiated into two distinct layers: the palisade parenchyma (elongated, tightly packed cells on the adaxial side) and the spongy parenchyma (loosely arranged, irregular cells with large air spaces on the abaxial side).<br>Monocot Leaf: The mesophyll is not differentiated into palisade and spongy layers. The parenchyma cells are a single, homogeneous tissue with intercellular spaces.<br>o Vascular Bundles:<br>Dicot Leaf: Vascular bundles vary in size depending on the veins. The larger bundles |

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| n<br>a<br>m<br>e | (veins) are surrounded by a prominent bundle sheath.<br>Monocot Leaf: The vascular bundles are of similar size, though some differ in the main veins. They are arranged in a parallel fashion, and each bundle is enclosed by a prominent, thick-walled bundle sheath. |
| s **15.**<br><br>P<br>P<br>r<br>e | (i)<br>1. **Understanding adaptations**: It helps us understand the structural adaptations of plants to diverse environmental conditions, such as adaptations for water conservation in dry areas or for gas exchange in aquatic environments.<br>2. **Classification and identification**: Anatomical features are used to distinguish and classify different plant groups, including monocots, dicots, and gymnosperms.<br>3. **Crop improvement**: Linking anatomical features with physiological processes helps in improving crop plants for better yield, pest resistance, and other desired traits.<br>(ii)<br>1. **Epidermal Tissue System**: It forms the outermost covering and includes tissues such as the epidermis, stomata, and epidermal appendages like trichomes and hairs.<br>2. **Ground Tissue System**: This system comprises all tissues except the epidermis and vascular bundles. It consists of simple tissues such as parenchyma, collenchyma, and sclerenchyma.<br>3. **Vascular Tissue System**: Made up of complex tissues that are involved in transport, this system includes the xylem and phloem, which together form the vascular bundles. |

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