

Anatomy of Flowering plants

Exercise

1. Promeristem or embryonic meristem gives rise to primary meristem. Primary meristem then gives rise to permanent tissues.
2. Xylem in Angiosperms is composed of Xylem vessels (Trachea), Xylem tracheids, xylem parenchyma and Xylem sclerenchyma (fibers) in Angiosperms.
3. Intercellular spaces are characteristic features of parenchyma. It is absent in collenchyma due to cellulosic pectin deposition and in sclerenchyma due to lignin deposition
4. In a dicot stem vascular bundles have xylem and phloem on the same radius (conjoint), inner xylem and outer phloem (collateral), with cambium (open) and protoxylem is inner and metaxylem is outer (endarch)
5. Inter fascicular means in between the vascular bundles. The cambium is produced from the cells of medullary rays
6. Since monocots lack cambium, new vascular connections can't be established between the stock and scion (graft) and hence the graft will die.
7. Maize is a monocot. In a monocot stem vascular bundles have xylem and phloem on the same radius (conjoint), inner xylem and outer phloem (collateral), without cambium (close) and protoxylem is inner and metaxylem is outer (endarch).
8. Dorsiventral leaves found in dicots have different shades of green. Dark green on the ventral surface due to compactly arranged palisade cells and light green on the dorsal surface due to loosely arranged spongy cells.
9. If cambium is present between xylem and phloem it is open.
10. Actively dividing cells or primary meristems help in longitudinal growth (hence present at root and shoot tips). Secondary meristem (vascular and cork cambium) increase the girth of plant.
11. Vessels are multicellular while tracheids are unicellular.
12. Amphivasal (leptocentric): Phloem in centre completely surrounded by xylem
Amphicribal (hadrocentric): Xylem in centre completely surrounded by phloem
13. Bicolateral vascular bundle will have one xylem surrounded by cambium and phloem on either sides. A bicolateral vascular bundle is hence always open. It is characteristically seen in the stem of family Cucurbitaceae
14. Radial vascular bundle is seen in roots.
17. Lenticels help in exchange of gases and hydathodes help in guttation (removal of solid water)
19. The complementary cells is a mass of cells in plants, formed from the cork cambium at the position of the lenticels. It is a group of loosely arranged cells that aid in gaseous exchange through cork
20. Abnormal secondary growth is seen in monocots like Agave, Dracaena, Beet root etc.
21. Phellem + Phellogen (cork cambium) + Phelloderm (sec. cortex) = Periderm
22. Cork cambium and vascular cambium are examples of lateral meristems.
23. Duramen or heart wood is present in the centre and is loaded with tannins, resins etc. It no longer carries water and is quite durable. Hence it is the commercial wood.
24. Sap wood or Alburnum is present in the periphery of the tree. It is made of active xylem vessels.
25. Monocot stem don't have cambium. hence there is no secondary growth.
26. One annual ring is formed by one spring wood (light coloured) ring and one autumn wood (dark coloured) ring.
- 28-29. All types of cambium are lateral meristem.

30. Vascular cambium ring in stem is made up of
Intra fascicular cambium (primary cambium) and inter fascicular cambium (secondary)
32. Procambium gives rise to primary cambium which is present between xylem and phloem within the bundle.
34. Motor cells or bulliform cells are large thin wall vacuolated cells present in leaf. During deficiency of water (Water stress) they help in rolling or folding of leaves.
36. Endodermis of root is made up of two types of cells- Casparian strips or suberised cells (which don't allow water to enter) and passage cells near protoxylem which allows water to enter the root.
37. Kranz anatomy is seen in leaves of plants which show C4 cycle like sugarcane, maize, Amaranthus etc. Here the mesophyll cells have granal chloroplasts while bundle sheath cells have agranal chloroplasts.
40. Velamen is a hygroscopic tissue which absorbs water. It is seen in epiphytes like Vanda (orchid)
42. According to histogen theory,
dermatogen forms epidermis or epiblema
periblem forms cortex and endodermis
plerome forms pith, vascular bundles, pericycle and medullary rays
43. Exarch condition: Protoxylem outwards and meta xylem seen in roots
Dicot roots have 2-6 xylem bundles (diarch- hexarch)
Monocot roots have more than 6 vascular bundles (polyarch)
45. Isobilateral leaves found in monocots have same shade of light green on the ventral surface and the dorsal surface due to loosely arranged spongy cells.
No Palisade cells are seen.
48. Collenchyma with extra cellulose and pectin provides tensile strength. It is present in hypodermis of a dicot stem.
50. Dendro- tree chrono- age/time
51. Growth rings are formed due to vascular cambium. It is present within the stele hence called stelar cambium. It formed by Intra-fascicular cambium (intra stelar) and inter fascicular cambium (inter stelar)
52. Cork is impervious to water due to suberin.
53. Guard cells are dumb bell shaped in monocots and bean shaped in dicots. The control opening and closing of stomata.
55. Dicot stem has vascular bundles in a ring. Monocot stem has scattered vascular bundles.
56. Periderm is formed by phellogen (cork cambium)
57. Intercalary meristem at base of internode: Grasses or wheat
Intercalary meristem at base of node: Mint
Intercalary meristem at base of leaf: Pinus
58. Phloem is also called bast.
62. Companion cells are components of sieve tubes which are found only in angiosperm
66. Vessels (Xylem) are lignified cells which are dead. Hence no nucleus
Sieve tube has cytoplasm but no nucleus. The nucleus of companion cell controls it.
67. Quiescent cells are inactive cells which are not dividing.
68. Bark includes phellem, phellogen, phelloderm, crushed primary cortex, secondary and primary phloem.
72. Activities of xylem vessels get blocked by bladder like ingrowth from neighbouring parenchyma cells called tyloses.
73. Barley is a monocot.
74. Palisade parenchyma is absent in monocot leaf. Sorghum (jowar) is a monocot.

78. Stomata open when there is endo-osmosis of water in the guard cells. This occurs in the following conditions
 - a. decrease in water potential
 - b. influx (entry) of K^+ ions in the guard cell
 - c. efflux (exit) of H^+ ions from the guard cell
79. Sclerids or stone cells are sclerenchymatous cells with very large amount of lignin deposition.
87. Simple permanent tissues- Parenchyma, Collenchyma and Sclerenchyma
Complex permanent tissues- Xylem and phloem
90. Late wood or autumn wood has less number of xylem elements than early wood or spring wood.
93. Companion cells load sucrose from the stored reserves of a plant into the sieve tubes by expenditure of energy (active)
95. Open vascular bundle contains cambium which further gives rise to secondary xylem and secondary phloem.

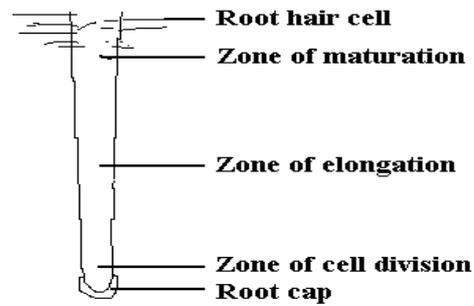
ASSERTION & REASON

1. In collateral vascular bundles, phloem is located towards outer side.
2. The cells of the quiescent centre show lower their division rate than that in the surrounding meristem.
3. Velamen tissue is found in epiphytic plants like Orchids
5. Vascular cambium and cork cambium belongs to secondary meristem.
7. Lenticels are the porous tissue consisting of cells with intercellular spaces in the periderm and the bark of woody trees.
8. Waxy cuticle helps in preventing evaporation and epidermal hairs are used for the retention of water.
12. Amphistomatic leaves are the one showing presence of stomata at both the sides of the leaf.
13. In Collateral bundles, phloem is situated towards the outer side whereas cambium is absent in monocot plants.
14. The conduction of water through vessels is a passive process which does not require energy to be supplied.
15. Intercalary meristem helps in the elongation of the organs and allows the fallen stems of cereals to become erect.

Previous Year Solutions

1. The vascular strand of monocot root has several (8 or more) alternate and radial xylem and phloem bundles.
2. Xylem fibres provide mechanical strength to the plants.
5. Companion cells are narrow, elongated living cells lying on the sides of the sieve tubes and are closely associated with them through compound plasmodesmata.
7. Ground tissue system includes whole of interior of plant except vascular system.
11. Chronology – the arrangement of events or dates in the order of their occurrence
12. Pericycle is the important layer as a part of vascular cambium, cork cambium along with lateral roots develop from it.
15. Casparian strips is the band of thickening in dicot root epidermis.
16. The vascular bundles of monocot plants show the presence of phloem towards the outer side and xylem on the inner side.
17. The light coloured part is the functional part in an annual ring and is known as the sap wood or alburnum.
18. Bast fibres are the phloem fibres and are specialised for providing mechanical strength.

21. The cotton fibres are the outgrowth of the epidermal layer.
22. Root hair is the zone for water absorption in plant roots.
24. Amphivasal is also known as leptocentric bundle.
25. Gymnosperms lacks vessels and fibres.
26. Intercalary meristem is a separate group of meristem used for organ elongation.
27. Heart wood tracheids and vessels are plugged by the ingrowth of adjacent parenchyma cells into their cavities through their pits so they are non functional.
29. Protoxylem lies towards the centre of the stem.
30. Cork cambium divides inner side to form secondary cortex and outer side to form cork.
32. Companion cells are the one which is formed around the sieve tube elements.
33. Lenticels are the structures responsible for transpiration through barks
39. Companion cells are the thin walled living cells, lying on the sides of sieve tube
40. Apical meristem generally remains free from any infection
42. Heart wood is stronger and more durable than sap wood and it is a non functional part of secondary xylem
43. The central part of sieve tube elements consists of a network of canals containing P – protein
45. Sap wood is the functional lighter part of annual ring.
48. Apical meristems are present at the tips of stem, root, branches and increases length. 49. Teratology – The scientific study of congenital abnormalities and abnormal functions
Limnology – The study of biological, chemical and physical features of lakes and other fresh water bodies.
Palaeontology – Study of science dealing with fossils
50. Bulliform cells are the large bubble shaped epidermal cells occurring in groups on the upper surface of many grasses.
51. In dicot stem, vascular strand is in the form of eustele or ring around central pith.
52. Velamen tissues are specialised in absorption of nutrients in Orchids
53. Plerome is located internal to the periblem and is the central region where cells shows a tendency to elongate.
54. Pteridophytes are not showing the presence of sieve tubes.
55. Casparian strips consists of both suberin & lignin deposited in their endodermis (Esau. 1965)
56. Vascular cambial ring is of partly primary primary and secondary in origin
57. Amphivasal is the arrangement of the bundles in which phloem is present at the centre of the vascular bundle and is completely surrounded by xylem. Eg. *Dracaena*
58. Teak and Pine shows secondary growth.
59. Passage cells are frequently found in endodermis and exodermis along with occurs in the form of short cells in the dimorphic type of exodermis.
60. Aerenchyma is found in aquatic plants to maintain the buoyancy.
65. Jute fibres are the bast fibres which are the plant fibres collected from the phloem or bast surrounding the stem of certain, mainly dicot plants.
66. Monocot stem phloem consists of sieve tubes, companion cells, phloem fibres.
67. Production of callose (b-1, 3 glucan) in response to wounding or high-temperature stress is used to seal off damaged sieve tubes. Callose also seals off sieve pores during overwintering in deciduous plants. Callose is deposited between the plasma membrane and cell wall, eventually blocking sieve pores.
- 68.



69. Xylem of monocot root is of polyarch condition as it consists of numerous xylem bundles and exarch conditions.
70. Intercalary meristem is located at the base of leaves, causing elongation of organs.
71. Endodermis prevents evaporation of water.
72. Collenchyma is a simple permanent tissue of refractile living cells.
73. Pericycle is one or more layers present below endodermis.
74. Monocot stem possess vascular bundles in the form of atactostele containing large number of vascular bundles.
75. Bicollateral vascular bundles have phloem both on outer and inner side of xylem.
76. Sieve tubes are having many small pores or sieve pits on their lateral walls
77. P - protein plugs the damaged network of sieve tubes.
78. Interfascicular cambium arises secondarily from the cells of medullary rays which occurs at the level of intrafascicular strips.
79. Angiosperms shows the presence of companion cells around the sieve tubes.
80. The pit cavity in bordered pits is in the form of a flask with a narrow aperture & a wide base.
81. Heart wood is the non functional wood formed by deposition of oils, resins, gums, by tyloses formation.
82. Aerenchyma is the specialised one present in aquatic plants containing large air cavities storing gases and making plants buoyant.
83. Cuticle acts as a separate layer on the outside above epidermis.
84. Same hint as Q. 82.
85. Collenchyma consists of pectocellulose thickenings.
86. Duramen are the non functional heart wood.
88. Shoot tips and root tips are the first one to get formed from primary tissues.
89. Phellogen is the cork cambium and shows the secondary growth in dicot stem.
90. Lenticels are the specialised cells present in the bark & is utilised for transpiration.
91. Meristematic cell walls are thin, elastic and made of cellulose.
92. Root pockets are present instead of root caps in hydrophytes.
94. Epiblema – outer layer, Cortex – below epiblema, endodermis – innermost layer of cortex, Pericycle – layer after endodermis
95. Quiescent centre is found in the centre of root apex where cell division is very less.
96. Meristem tissues are the immature cells which are specialised for continuous division.
98. The vascular bundles of monocot roots are arranged in the form of ring around a central pith and the protoxylem lies towards the outside while the metaxylem faces inwards.
100. Palisade parenchyma lies below the upper epidermis and the palisade mesophyll is rich in chloroplasts.
101. Lenticels are the aerating pores in the bark of the plants and appear on the surface of the bark as raised scars containing oval, rounded depressions.
103. Intercalary meristem helps in the elongation of organs.
105. Meristematic cells are the one which are specialised for continuous division and bring growth.
108. Quiescent centre is present in the centre of the root apex and shows very less number of cell divisions as there is very little synthesis of protein, RNAs and DNA.
110. Secondary xylem forms the bulk of the stem and is known as wood, it consists of vessels, tracheids, wood fibres and wood parenchyma.
112. Plasmodesmata help in the proper coordination amongst cells and facilitates transport of substances.

113. Phellem is produced by phellogen on the outer side.
114. Bicollateral bundles consists of a strip of vascular cambium on both outer and inner sides of xylem, and is the common characteristics of Cucurbitaceae, Solanaceae, Convolvulaceae etc.
117. Root shows the presence of protoxylem in contact with pericycle as well as at the tips whereas metaxylem is present towards the centre.
120. In a dicot root, the vascular bundles are exarch.