Chapter

6 Anatomy of Flowering Plants

TYPE A : MULTIPLE CHOICE QUESTIONS

1. *Cycas* stem shows ***[1997]***
(a) porous wood (b) manoxylic wood
(c) pycnoxylic wood (d) ring porous wood

2. Aerenchyma is found in ***[1997]***
(a) parenchyma (b) xylem
(c) phloem (d) sclerenchyma

3. Which of the following tissue is absent in vascular bundles of monocot stem ? ***[1997]***
(a) Xylem (b) Phloem
(c) Cambium (d) All of these

4. Cork cambium is a ***[1999]***
(a) lateral meristem
(b) apical meristem
(c) intercalary meristem
(d) primitive meristem

5. Endodermis is a part of ***[1999]***
(a) cortex (b) pericycle
(c) medulla (d) epidermis

6. Lateral root in higher plants arise from ***[1999]***
(a) cortex (b) pericycle
(c) epidermis (d) endodermis

7. Cambium of root is an example of ***[2000]***
(a) apical meristem
(b) intercalary meristem
(c) primary meristem
(d) secondary meristem

8. Which of the following is enucleate at maturity? ***[2000]***
(a) Companion cell (b) Meristematic cell
(c) Parenchyma (d) Sieve tube cell

9. Porous wood contains ***[2001]***
(a) vessels (b) tracheids
(c) fibres (d) parenchyma

10. Passage cells are found in ***[2002]***
(a) endodermis (b) pericycle
(c) cortex (d) epiblema

11. Fascicular cambium is the cambium of vascular bundle of ***[2002]***
(a) monocot stem (b) dicot stem
(c) monocot leaf (d) dicot leaf

12. Mesophyll is usually differentiated in ***[2002]***
(a) monocot leaf (b) isobilateral leaf
(c) dorsiventral leaf (d) both 'a' and 'b'

13. In a dicotyledonous stem, the sequence of tissues from the outside to the inside is ***[2003]***
(a) phellem-pericycle-endodermis-phloem
(b) phellem-phloem-endodermis-pericycle
(c) phellem-endodermis-pericycle-phloem
(d) pericycle-phellem-endodermis-phloem

14. The quiescent centre in root meristem serves as a
(a) site for storage of food which is utilized during maturation. ***[2003]***
(b) reservoir of growth hormones.
(c) reserve for replenishment of damaged cells of the meristem.
(d) region for absorption of water.

15. In a plant organ which is covered by periderm and in which the stomata are absent, some gaseous exchange still takes place through ***[2004]***
(a) aerenchyma (b) trichomes
(c) pneumatophores (d) lenticels

16. Companion cells in plants are associated with ***[2004]***
(a) vessels (b) sperms
(c) sieve elements (d) guard cells

17. Cork cambium results in the formation of cork which becomes impermeable to water due to the accumulation of ***[2004]***
(a) resins (b) suberin
(c) lignins (d) tannins

18. Which one of the following statements pertaining to plant structure is correct? ***[2005]***
(a) Cork lacks stomata but lenticels carry out transpiration.
(b) Passage cells help in transfer of food from cortex to phloem.
(c) Sieve tube elements possess cytoplasm but no nuclei.
(d) The shoot apical meristem has a quiescent centre.

19. In which one of the following would you expect to find glyoxysomes ? ***[2005]***
(a) Endosperm of wheat
(b) Endosperm of castor
(c) Palisade cells in leaf
(d) Root hairs

20. Grafting is successful in dicots but not in monocots because the dicots have ***[2006]***
(a) vascular bundles arranged in a ring
(b) cambium for secondary growth
(c) vessels with elements arranged end to end
(d) cork cambium

21. In the sieve elements, which one of the following is the most likely function of P-proteins? ***[2006]***
(a) Deposition of callose on sieve plates.
(b) Providing energy for active translocation.
(c) Autolytic enzymes.
(d) Sealing mechanism on wounding.

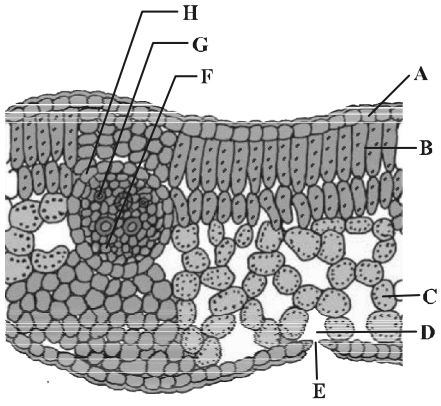
22. Two cross-sections of stem and root appear simple, when viewed by naked eye. But under microscope, they can be differentiated by ***[2009]***
(a) exarch condition of root and stem
(b) endarch condition of stem and root
(c) endarch condition of root and exarch condition of stem
(d) endarch condition of stem and exarch condition of root

23. If a stem is girdled ***[2012]***
(a) Root dies first
(b) Shoot dies first
(c) Both die together
(d) None of the above would die

24. Which of the following statement(s) is/are true?
(A) Uneven thickening of cell wall is characteristic of sclerenchyma. ***[2013]***
(B) Periblem forms cortex of the stem and the root.
(C) Tracheids are the chief water transporting elements in gymnosperms.
(D) Companion cell is devoid of nucleus at maturity.
(E) The Commercial cork is obtained from *Quercus suber*.
(a) A and D only (b) B and E only
(c) C and D only (d) B, C and E only

25. Sclerenchyma usually_____ and _____ protoplasts. ***[2014]***
(a) live, without (b) dead, with
(c) live, with (d) dead, without

26. T.S. of dicot leaf passing through the midrib is given below, certain parts have been indicated by alphabets. Choose the correct option.



[2015]
(a) A – Epidermis, B – Spongy parenchyma, C – Palisade parenchyma, D – Stomata, E – Guard cells, F – Phloem, G – Metaxylem, H – Protoxylem

(b) A – Epidermis, B – Palisade parenchyma, C – Spongy parenchyma, D – Sub-stomatal cavity, E – Stoma, F – Phloem, G – Metaxylem, H – Bundle sheath

(c) A – Epidermis, B – Palisade parenchyma, C – Spongy parenchyma, D – Stomata, E – Guard cells, F – Epidermis, G – Xylem, H – Phloem

(d) A – Epidermis, C – Palisade parenchyma, C – Spongy parenchyma, D – Stomata, E – Guard cells, F – Phloem, G – Metaxylem, H – Protoxylem

27. Contractile tissues have the following features
(i) Mesodermal in origin
(ii) They contain stretch receptors.
(iii) Rhythmic contractions are seen in them
(iv) They do not fatigue during the life of the animal
Which of the above are characteristics of sphincters? ***[2015]***
(a) All the four
(b) Only (i), (ii) and (iii)
(c) Only (i), (ii) and (iv)
(d) Only (i), (iii) and (iv)

28. Meristematic tissue responsible for increase in girth of tree trunk is ***[2016]***
(a) Apical meristem
(b) Intercalary meristem
(c) Lateral meristem
(d) Phellogen

29. In stems, the protoxylem lies towards the _____ and the metaxylem lies towards the _____ of the organ.
(a) centre; periphery
(b) periphery; centre
(c) periphery; periphery
(d) centre; centre ***[2017]***

TYPE B : ASSERTION REASON QUESTIONS

Directions for (Qs. 30-38) : These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(c) If the Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

(e) If the Assertion is incorrect but the Reason is correct.

30. **Assertion :** Thick cuticle is mostly present in disease resistant plants.
Reason : Disease causing agents cannot grow on cuticle and cannot invade the cuticle. ***[1997]***

31. **Assertion:** Cambium is a lateral meristem and cause growth in width.
Reason: Cambium is made up of fusiform and ray initials in stem. ***[1998]***

32. **Assertion :** Higher plants have meristematic regions for indefinite growth.
Reason : Higher plants have root and shoot apices. ***[1999]***

33. **Assertion :** In collateral vascular bundles, phloem is situated towards inner side.
Reason : In monocot stem, cambium is present. ***[2000]***

34. **Assertion :** Collenchyma is thick walled dead tissue.
Reason : Collenchymatous cells show thickenings of pectin. ***[2002]***

35. **Assertion:** The two cotyledons in seed are embryonic leaves.
Reason: The embryo contains radicle and plumule. ***[2002]***

36. **Assertion :** In angiosperms, the conduction of water is more efficient because their xylem has vessels. ***[2006]***
Reason : Conduction of water by vessel elements is an active process with energy supplied by xylem parenchyma rich in mitochondria.

37. **Assertion :** In woody stems, the amount of heart wood continues to increase year after year.

Reason : The cambial activity continues uninterrupted. ***[2007]***

38. **Assertion :** Petroplants produce large amount of latex.

Reason : The latex contains long chain hydrocarbons. ***[2007]***

Directions for (Qs. 39-41) : Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

39. **Assertion :** Vessels are more efficient for water conduction as compared to tracheids. ***[2010]***

Reason : Vessels are dead lignified.

40. **Assertion:** Bulliform cells are useful in the unrolling of leaf.

Reason: Bulliform leaves store water. ***[2011]***

41. **Assertion :** In stem, pericycle take active part in secondary growth.

Reason : In dicots, pericycle has the capacity to produce lateral roots. ***[2013]***

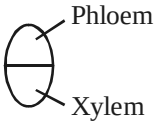
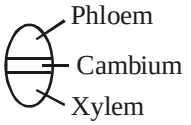
HINTS & SOLUTIONS

Type A : Multiple Choice Questions

1. (b) *Cycas* stem shows monoxylic wood with broad parenchymatous rays and often contain abundant resinous cells and resin canals. Towards the periphery of the stem, cycads produce a 'leaf armour' consisting of the tightly packed, helically arranged leaf bases.

2. (a) Aerenchyma is the modification of parenchyma tissue in which cells are arranged in such a way that - large air filled spaces are formed. Aerenchyma is found in aquatic plants to produce buoyancy.

3. (c)

Monocot vascular bundle	**Dicot vascular bundle**
	
No secondary growth, cambium absent *i.e.* V.B. is closed	secondary growth, V.B. is open.

4. (a) Cork cambium (phellogen) is a secondary lateral meristem which develops from permanent tissues in the region of epidermis, hypodermis, cortex and even in outer layers of phloem.

5. (a) Endodermis is the inner most layer of cortex. The cells are characterized by the presence of casparian strips.

6. (b) The lateral roots arise from the cell of pericycle and hence, the root branches are said to be endogenous in origin (arising from a layer inner to endodermis). The lateral roots help in absorption of water and mineral salts from the soil. The meristematic cells of the lateral root push through the endodermis and cortex and then pierce through the epidermis to come out to form the lateral root.

7. (d) The cambium is secondary in its functional aspect since it forms secondary tissues like the secondary xylem and secondary phloem. It is, however, primary in origin.

8. (d) Sieve tube cell is enucleate at maturity due to the degeneration of its nucleus during its developmental process. The companion cell-that develops from the same initial as the sieve tube cell, possesses the nucleus throughout its life. The companion cell carries out the function of the sieve tube cell in the event of its degeneration.

9. (a) Porous wood contains vessels, with sieve cells, which contains passages for movement of substances.

10. (a) Passage cells are found in endodermis which allow a limited transfer of materials between the cortex and the vascular cylinder.

11. (b) In dicot stem, fascicular cambium and interfascicular cambium join to form a complete ring which helps in secondary growth.

12. (c) In a dorsiventral leaf, mesophyll is differentiated into two layers *i.e.* palisade parenchyma and spongy parenchyma.

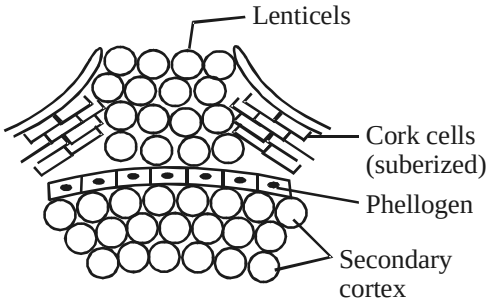
13. (c) In a dicotyledonous stem, the sequence of tissues from outside to the inside is phellem-endodermis-pericycle-phloem.

14. (c) The concept of Quiescent Centre was proposed by Clowes in 1961. On the basis of autoradiographic studies of DNA synthesis in the root tip of zea, he found a reservoir of cells having low DNA, RNA and protein concentration. He called it as Quiescent Centre. They may or may not divide. It is resistant to damages.

15. (d) During secondary growth, where epidermis is replaced by tough and hard periderm, the cracked/ruptured epidermis forms the small holes called lenticels which help in gaseous exchange.

16. (c) Companion cells are long elongated living cells, that lie on the sides of the sieve tubes in phloem. Companion cells control the activities of the sieve tube through plasmodesmata.

17. (b) Phellogen produces cork or phellem on the outer side. It consists of dead and compactly arranged rectangular cells that possess suberised cell walls.



18. (c) Sieve tube elements possess cytoplasm but lack nucleus at maturity. Its metabolic activities are regulated by the nucleus of a closely associated cell called companion cell.

19. (b) Glyoxysomes are found in the plant cells particularly in the cells of germinating fatty seeds, *e.g.* endosperm of castor.

20. (b) Grafting is a horticultural technique whereby tissues from one plants are inserted into those of another so that the sets of vascular tissues may join together. Grafting is successful in dicots because vascular bundles are arranged in a ring and have cambium for secondary growth.

21. (a) In the sieve elements, P-proteins deposit callose on sieve plates.

22. (d) The cross sections of stem and root appear simple, when viewed by naked eye but under microscope they can be differentiated as endarch condition in stem and exarch condition in root. In endarch, protoxylem is present towards the center of stem while metaxylem towards the pericycle. In the exarch condition, protoxylem is present towards pericycle and metaxylem towards the center of the root.

23. (a) If a stem is girdled, root dies first, as the food synthesized by leaves is not able to reach to the roots.

24. (d)

25. (d) Sclerenchyma consists of long, narrow cells with thick and lignified cell walls having a few or numerous pits. They are usually dead and without protoplasts.

26. (b) **27. (b)** **28. (c)**

29. (a) The first formed primary xylem elements are called protoxylem and the later formed primary xylem is called metaxylem. In stems, the protoxylem lies towards the centre (pith) and the metaxylem lies towards the periphery of the organ. This type of primary xylem is called endarch.

Type B : Assertion Reason Questions

30. (e) Plant cuticles are a protective waxy covering produced only by the epidermal cells of leaves, young shoots and all other aerial plant organs. In addition to its function as a permeability barrier for water and other molecules, the micro and nano-structure of the cuticle confer specialized surface properties that prevent contamination of plant tissues with external water, dirt and micro-organisms. The waxy sheet of cuticle also functions in defence, forming a physical barrier that resists penetration by virus particles, bacterial cells, and the spores or growing filaments of fungi.

31. (b) Fusiform initials are vertically elongated cells that produce xylem and phloem elements. Ray initials are isodiametric and produce parenchymatous rays in secondary xylem and phloem.

32. (a) The root apex and shoot apex are meristematic in nature. These meristematic tissues are embryonic in origin. They are primary in origin because it develops from embryonic tissues and primary in function

because they form the primary structure of the plant cell, the root apex and shoot apex, that live till the death of the whole plant. Hence, plants have the feature of indefinite growth.

33. (d) Collateral vascular bundles have the xylem pointing towards the inner side of the phloem. In the same way in monocots, cambium is absent. Collateral vascular bundles are present in stems and leaves of angiosperms and gymnosperms.

34. (e) Collenchyma is made up of living cells with unevenly thickened cell wall. Their cell wall is made up of cellulose and pectin. Collenchyma are present beneath the epidermis of young stem, petioles and midrib of leaves *etc*. These are absent in underground tissues and leaves and stems of monocots.

35. (b) During epigeal germination, cotyledons come out of the soil. The green cotyledons function as leaves of the seedling. They manufacture food and sustain the young seedling till the plumule gives rise to new leaves.

36. (d) Xylem is the water conducting tissue. It consists of living cells like parenchyma and dead cells like tracheary elements.

37. (a) In woody trees, the central portion of stem is dark in colour. It is hard and tough due to deposition of resins, tannins, gums and formation of tyloses. This central hard portion is called heart wood. It is formed by secondary growth. Due to cambial activity secondary xylem becomes non-functional and forms heart wood or duramen. It is more durable and little susceptible to attack of pathogens. The cambial activity continues in this region.

38. (a) Petroplants are plants having large amount of latex with long chain hydrocarbons. Latex of these plants are a good substitute for liquid fuels or petroleum. Cultivation of petroplants is a part of energy- cropping. Dr. Calvin was the scientist who identified petrocrops. They have property of converting large amount of their photosynthates into latex along with hydrocarbons. Some important petrocrops are *Euphorbia antisyphilitica*, *E. lathyris Calotropis procera etc*.

39. (b) Vessels are more efficient for water conduction as compared to tracheids. Vessels resemble tracheids very much in structure and function. But unlike tracheids these are like long tubes arranged in vertical row formed of cylindrical cells arranged to end with their end walls completely dissolved. These are also dead and lignified.

40. (b) In isobilateral leaves, the upper epidermis contains specialized cells, *i.e.*, bulliform or motor cells. They are highly vacuolate and can store water, if available. However, in case of water deficiency, the bulliform cells lose water and become flaccid. As a result, the leaf gets rolled up to reduce the exposed surface. The bulliform cells are also useful in the unrolling of leaf during its development.

41. (c) Pericycle is the outermost layer of stele. In dicot stems, pericycle strengths the stem and provides protection to the vascular bundles. In angiosperms (dicots), pericycle gives rise to lateral roots and contribute to the vascular cambium often diverging into a work cambium.