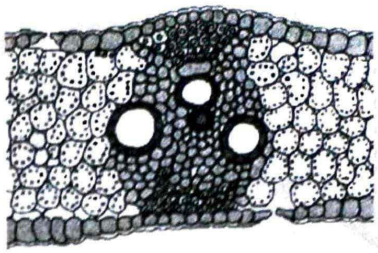
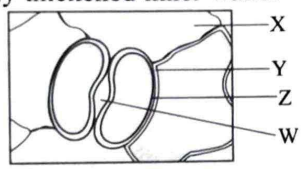
CHAPTER

6 Anatomy of Flowering Plants



6.1. The Tissues System

1. In the given figure, which component has thin outer walls and highly thickened inner walls?



(A) W (B) X
(C) Y (D) Z **[NEET 2024]**

2. Vascular bundles in monocotyledons are considered closed because:
(A) a bundle sheath surrounds each bundle
(B) cambium is absent
(C) there are no vessels with perforations
(D) xylem is surrounded all around by phloem.
[AIPMT Cancelled 2015]

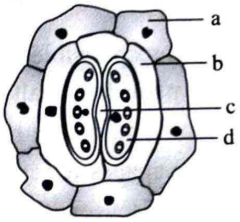
3. Which of the following statements is not true for stomatal apparatus?
(A) Guard cells invariably possess chloroplasts and mitochondria.
(B) Guard cells are always surrounded by subsidiary cells.
(C) Stomata are involved in gaseous exchange.
(D) Inner wall of guard cells are thick.
[NEET Karnataka 2013]

4. Closed vascular bundles lack:
(A) ground tissue (B) conjunctive tissue
(C) cambium (D) pith.
[AIPMT Screening 2012]

5. Ground tissue includes:
(A) all tissues except epidermis and vascular bundles.
(B) epidermis and cortex.
(C) all tissues internal to endodermis.
(D) all tissues external to endodermis.
[AIPMT Screening 2011]

6. In land plants, the guard cells differ from other epidermal cells in having:
(A) mitochondria (B) endoplasmic reticulum
(C) chloroplasts (D) cytoskeleton.
[AIPMT Screening 2011]

7. Given below is the diagram of a stomatal apparatus. In which of the following, all the four parts labelled as a, b, c and d are correctly identified?



	a	b	c	d
(A)	Subsid-iary cell	Epidermal cell	Guard cell	Stomatal aperture
(B)	Guard cell	Stomatal aperture	Subsidiary cell	Epidermal cell
(C)	Epider-mal cell	Guard cell	Stomatal aperture	Subsidiary cell
(D)	Epider-mal cell	Subsidiary cell	Stomatal aperture	Guard cell

[AIPMT Mains 2010]

8. Vascular tissues in flowering plants develop from:
(A) phellogen (B) plerome
(C) periblem (D) dermatogen.
[AIPMT Screening 2008]

9. What happens during vascularisation in plants?
(A) Differentiation of procambium is immediately followed by the development of secondary xylem and phloem.
(B) Differentiation of procambium followed by the development of xylem and phloem.
(C) Differentiation of procambium, xylem and phloem is simultaneous.
(D) Differentiation of procambium followed by the development of primary phloem and then by primary xylem. **[AIPMT 2000]**

6.2. Anatomy of Dicotyledonous and Monocotyledonous Plants

10. Given below are two statements:

Statement I: In a dicotyledonous leaf, the adaxial epidermis generally bears more stomata than the abaxial epidermis.

Statement II: In a dicotyledonous leaf the adaxially placed palisade parenchyma is made up of elongated cells, which are arranged vertically and parallel to each other.

In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I is true but Statement II is false.

(B) Statement I is false but Statement II is true.

(C) Both Statement I and Statement II are true.

(D) Both Statement I and Statement II are false.

[Re-NEET 2024]

11. Bulliform cells are responsible for:

(A) protecting the plant from salt stress.

(B) increased photosynthesis in monocots.

(C) providing large spaces for storage of sugar.

(D) inward curling of leaves in monocots. **[NEET 2024]**

12. Secondary xylem and phloem in dicot stem are produced by:

(A) phellogen (B) vascular cambium

(C) apical meristems (D) axillary meristems.

[NEET 2018]

13. Casparian strips occur in:

(A) cortex (B) pericycle

(C) epidermis (D) endodermis. **[NEET 2018]**

14. Cortex is the region found between:

(A) epidermis and stele

(B) pericycle and endodermis

(C) endodermis and pith

(D) endodermis and vascular bundle.

[NEET Phase-II 2016]

15. Water containing cavities in vascular bundles are found in:

(A) sunflower (B) maize

(C) *Cycas* (D) *Pinus*.

[AIPMT Screening 2012]

16. As compared to a dicot root, a monocot root has:

(A) more abundant secondary xylem

(B) many xylem bundles

(C) inconspicuous annual rings

(D) relatively thicker periderm. **[AIPMT Mains 2012]**

17. The annular and spirally thickened conducting elements generally develop in the protoxylem when the root or stem is:

(A) maturing (B) elongating

(C) widening (D) differentiating.

[AIPMT Screening 2009]

18. In barley stem, vascular bundles are:

(A) open and scattered (B) closed and scattered

(C) open and in a ring (D) closed and radial.

[AIPMT Screening 2009]

19. Palisade parenchyma is absent in leaves of:

(A) *Sorghum* (B) mustard

(C) soybean (D) gram.

[AIPMT Screening 2009]

20. Four radial VB are found on:

(A) dicot root (B) monocot root

(C) dicot stem (D) monocot stem.

[AIPMT 2002]

21. Pith and cortex do not differentiate in:

(A) monocot stem (B) dicot stem

(C) monocot root (D) dicot root. **[AIPMT 1988]**

22. The transverse section of a plant shows following anatomical features:

(I) Large number of scattered vascular bundles surrounded by bundle sheath.

(II) Large conspicuous parenchymatous ground tissue.

(III) Vascular bundles conjoint and closed.

(IV) Phloem parenchyma absent.

Identify the category of plant and its part:

(A) Monocotyledonous root

(B) Dicotyledonous stem

(C) Dicotyledonous root

(D) Monocotyledonous stem **[NEET Sept. 2020]**

23. In the dicot root the vascular cambium originates from:

(A) intrafascicular and interfascicular tissue in a ring.

(B) tissue located below the phloem bundles and a portion of pericycle tissue above protoxylem.

(C) cortical region.

(D) parenchyma between endodermis and pericycle.

[NEET Odisha 2019]

24. Transition of radial vascular bundle in root to conjoint vascular bundle in stem occurs in which zone?

(A) Epicotyl (B) Hypocotyl

(C) Meristem (D) At base of stem

[AIPMT 1999]

25. Where do the casparian bands occur?

(A) Epidermis (B) Endodermis

(C) Pericycle (D) Phloem

[AIPMT 1994, 90]

26. Plant having column of vascular tissues bearing fruits and having a tap root system is:
(A) monocot
(B) dicot
(C) gymnosperm of dicot
(D) gymnosperm of monocot. **[AIPMT 1994]**

27. A bicollateral vascular bundle is characterised by:
(A) phloem being sandwiched between xylem
(B) transverse splitting of vascular bundle
(C) longitudinal splitting of vascular bundle
(D) xylem being sandwiched between phloem.
[AIPMT 1992]

28. Monocot leaves possess:
(A) intercalary meristem (B) lateral meristem
(C) apical meristem (D) mass meristem.
[AIPMT 1990]

29. Collenchyma occurs in the stem and petioles of:
(A) xerophytes (B) monocots
(C) dicot herbs (D) hydrophytes
[AIPMT 1990]

30. Pericycle of roots produces:
(A) mechanical support (B) lateral roots
(C) vascular bundles (D) adventitious buds.
[AIPMT 1990]

31. What is true about a monocot leaf?
(A) Reticulate venation.
(B) Absence of bulliform cells from epidermis.
(C) Mesophyll not differentiated into palisade and spongy tissues.
(D) Well differentiated mesophyll. **[AIPMT 1990]**

***32.** Given below are two statements:
Statement I: Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body.
Statement II: Exarch condition is the most common feature of the root system.
In the light of the above statements, choose the correct answer from the options given below:
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.
[NEET 2023]

***33.** Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R):
Assertion (A): Late wood has fewer xylary elements with narrow vessels.
Reason (R): Cambium is less active in winters.
In the light of the above statements, choose the correct answer from the given options:
(A) A is true but R is false.
(B) A is false but R is true.
(C) Both A and R are true and R is the correct explanation of A.
(D) Both A and R are true but R is NOT the correct explanation of A. **[NEET 2023]**

***34.** Identify the **correct** statements:
(I) Lenticels are the lens-shaped openings permitting the exchange of gases.
(II) Bark formed early in the season is called hard bark.
(III) Bark is a technical term that refers to all tissues exterior to vascular cambium.
(IV) Bark refers to periderm and secondary phloem.
(V) Phellogen is single-layered in thickness.
Choose the correct answer from the options given below:
(A) (I), (II) and (IV) only
(B) (II) and (III) only
(C) (II), (III) and (V) only
(D) (I) and (IV) only **[NEET 2023]**

***35.** In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to:
(I) secretion of secondary metabolities and their deposition in the lumen of vessels.
(II) deposition of organic compounds like tannins and resins in the central layers of stem.
(III) deposition of suberin and aromatic substances in the outer layer of stem.
(IV) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.
(V) presence of parenchyma cells, functionally active xylem elements and essential oils.
Choose the correct answer from the options given below:
(A) (III) and (IV) only (B) (IV) and (V) only
(C) (II) and (IV) only (D) (I) and (II) only
[NEET 2022]

***36.** The anatomy of springwood shows some peculiar features. Identify the correct set of statements about springwood.
(I) It is also called as the earlywood.
(II) In spring season cambium produces xylem elements with narrow vessels.
(III) It is lighter in colour.
(IV) The springwood along with autumnwood shows alternate concentric rings forming annual rings.
(V) It has lower density.
Choose the correct answer from the options given below:
(A) (I), (III), (IV) and (V) Only
(B) (I), (II) and (IV) Only
(C) (III), (IV) and (V) Only
(D) (I), (II), (IV) and (V) Only **[NEET 2022]**

***Topics/Qs are in NEET latest syllabus but has been removed from NCERT.**

*37. Match List-I with List-II

List-I	List-II
(a) Lenticels	(i) Phellogen
(b) Cork cambium	(ii) Suberin deposition
(c) Secondary cortex	(iii) Exchange of gases
(d) Cork	(iv) Phelloderm

Choose the correct answer from the options given below.

	(a)	(b)	(c)	(d)
(A)	(iv)	(i)	(iii)	(ii)
(B)	(iii)	(i)	(iv)	(ii)
(C)	(ii)	(iii)	(iv)	(i)
(D)	(iv)	(ii)	(i)	(iii)

[NEET 2021]

*38. Select the correct pair.

(A)	Large colorless empty cells in the epidermis of grass leaves	Subsidiary cells
(B)	In dicot leaves, vascular bundles are surrounded by large thick walled cells	Conjunctive tissue
(C)	Cells of medullary rays that form part of cambial ring	Interfascicular cambium
(D)	Loose parenchyma cells rupturing and forming a lens shaped opening in bark	Spongy parenchyma

[NEET 2021]

*39. Which of the statements given below is not true about formation of annual rings in trees?

(A) Annual ring is a combination of spring wood and autumn wood produced in a year.

(B) Differential activity of cambium causes light and dark bands of tissue-early and late wood respectively.

(C) Activity of cambium depends upon variation in climate.

(D) Annual rings are not prominent in trees of temperate region. **[NEET 2019]**

*40. Plants having little or no secondary growth are:

(A) conifers

(B) deciduous angiosperms

(C) grasses

(D) cycads. **[NEET 2018]**

*41. Identify the wrong statement in context of heartwood.

(A) Organic compounds are deposited in it.

(B) It is highly durable.

(C) It conducts water and minerals efficiently.

(D) It comprises dead elements with highly lignified walls. **[NEET 2017]**

*42. Which of the following is made up of dead cells?

(A) Xylem parenchyma (B) Collenchyma

(C) Phellem (D) Phloem **[NEET 2017]**

*43. The vascular cambium normally gives rise to:

(A) phelloderm (B) primary phloem

(C) secondary xylem (D) periderm. **[NEET 2017]**

*44. The balloon-shaped structures called tyloses:

(A) originate in the lumen of vessels.

(B) characterise the sapwood.

(C) are extensions of xylem parenchyma cells into vessels.

(D) are linked to the ascent of sap through xylem vessels.

[NEET Phase-II 2016]

*45. Lenticels are involved in:

(A) transpiration (B) gaseous exchange

(C) food transport (D) photosynthesis.

[NEET 2013, AIPMT 2002]

*46. Age of a tree can be estimated by:

(A) its height and girth

(B) biomass

(C) number of annual rings

(D) diameter of its heartwood. **[NEET 2013]**

*47. The common bottle cork is a product of:

(A) dermatogen (B) phellogen

(C) xylem (D) vascular cambium.

[AIPMT Screening 2012]

*48. Gymnosperms are also called soft wood spermatophytes because they lack:

(A) cambium

(B) phloem fibres

(C) thick-walled tracheids

(D) xylem fibres. **[AIPMT Screening 2012]**

*49. Heartwood differs from sapwood in:

(A) presence of rays and fibres

(B) absence of vessels and parenchyma

(C) having dead and non-conducting elements

(D) being susceptible to pests and pathogens.

[AIPMT Screening 2010]

*50. ..... growth is increase in girth. It is caused by ..... meristem.

(A) Secondary, lateral (B) Tree, xylem

(C) Forest, desert (D) Apical, intercalary

[AIPMT Mains 2009]

*51. From which plant part phellogen originates and what are its main products?

	Origin	Product
(i)	Outer layer of cortex	Lenticels
(ii)	Endodermis	Lenticels
(iii)	Lenticels	Endodermis
(iv)	Lenticels	Cortex

*** Topics/Qs are in NEET latest syllabus but has been removed from NCERT.**

Options:

(A) (i) (B) (ii)

(C) (iii) (D) (iv)

[AIPMT Mains 2008 (Mod.)]

***52.** Which one of the following is resistant to enzyme action?

(A) Cork (B) Wood fibre

(C) Pollen exine (D) Leaf cuticle

[AIPMT 2008]

***53.** For a critical study of secondary growth in plants, which one of the following pairs is suitable?

(A) Teak and pine

(B) Deodar and fern

(C) Wheat and maiden hair fern

(D) Sugarcane and sunflower. **[AIPMT 2007]**

***54.** Ectophloic siphonostele is found in:

(A) *Osmunda* and *Equisetum*

(B) *Marsilea* and *Botrychium*

(C) *Adiantum* and Cucurbitaceae

(D) *Dicksonia* and Maiden hair fern. **[AIPMT 2005]**

***55.** Diffuse porous woods are characteristic of plants growing in:

(A) alpine region (B) cold winter regions

(C) temperature climate (D) tropics. **[AIPMT 2003]**

***56.** Which of the following meristems is responsible for extrastelar secondary growth in dicotyledonous stem?

(A) Intrafascicular cambium

(B) Interfascicular cambium

(C) Intercalary meristem

(D) Phellogen **[AIPMT 1998]**

***57.** Which exposed wood will decay faster?

(A) Sapwood

(B) Softwood

(C) Wood with lot of fibres

(D) Heartwood **[AIPMT 1993]**

***58.** Abnormally/anomalous secondary growth occurs in:

(A) *Dracaena* (B) ginger

(C) wheat (D) sunflower. **[AIPMT 1993]**

***59.** Out of diffuse porous and ring porous woods, which is correct?

(A) Ring porous wood carries more water for short period.

(B) Diffuse porous wood carries more water.

(C) Ring porous wood carries more water when need is higher.

(D) Diffuse porous wood is less specialised but conducts water rapidly throughout. **[AIPMT 1989]**

***60.** Periderm is produced by:

(A) vascular cambium

(B) fascicular cambium

(C) phellogen

(D) intrafascicular cambium. **[AIPMT 1993]**

***61.** Vascular cambium produces:

(A) primary xylem and primary phloem

(B) secondary xylem and secondary phloem

(C) primary xylem and secondary phloem

(D) secondary xylem and primary phloem.

[AIPMT 1990]

***62.** Commercial cork is obtained from:

(A) *Berberis*/Barberry (B) *Salix*/Willow

(C) *Quercus*/Oak (D) *Betula*/Birch

[AIPMT 1991]

***63.** Cork is formed from:

(A) cork cambium (phellogen)

(B) vascular cambium

(C) phloem

(D) xylem. **[AIPMT 1988]**

*6.3. The Tissues

64. Which of the following simple tissues are commonly found in the fruit walls of nuts and pulp of pear?

(A) Sclereids (B) Fibres

(C) Parenchyma (D) Collenchyma

[Re-NEET 2024]

65. Which one of the following is not found in Gymnosperms?

(A) Sieve cells (B) Albuminous cells

(C) Tracheids (D) Vessels **[Re-NEET 2024]**

66. Which of the following helps in maintenance of the pressure gradient in sieve tubes?

(A) Albuminous cells (B) Sieve cells

(C) Phloem parenchyma (D) Companion cells

[Re-NEET 2024]

67. Given below are two statements:

Statement I: Parenchyma is living but collenchyma is dead tissue.

Statement II: Gymnosperms lack xylem vessels but presence of xylem vessels is the characteristic of angiosperms.

In the light of the above statements, choose the correct answer from the options given below:

(A) Both Statement I and Statement II are false.

(B) Statement I is true but Statement II is false.

(C) Statement I is false but Statement II is true.

(D) Both Statement I and Statement II are true.

[NEET 2024]

***Topics/Qs are in NEET latest syllabus but has been removed from NCERT.**

68. Match List-I with List-II.

List-I	List-II
(a) Cells with active cell division capacity	(i) Vascular tissues
(b) Tissue having all cells similar in structure and function	(ii) Meristematic tissue
(c) Tissue having different types of cells	(iii) Sclereids
(d) Dead cells with highly thickened walls and narrow lumen	(iv) Simple tissue

Choose the correct answer from the options given below.

	(a)	(b)	(c)	(d)
(A)	(ii)	(iv)	(i)	(iii)
(B)	(iv)	(iii)	(ii)	(i)
(C)	(i)	(ii)	(iii)	(iv)
(D)	(iii)	(ii)	(iv)	(i)

[NEET 2021]

69. Regeneration of damaged growing grass following grazing is largely due to:
(A) secondary meristem (B) lateral meristem
(C) apical meristem (D) intercalary meristem.
[NEET 2019]

70. Phloem in gymnosperms lacks:
(A) albuminous cells and sieve cells
(B) sieve tubes only
(C) companion cells only
(D) both sieve tubes and companion cells. **[NEET 2019]**

71. Transmission tissue is characteristic feature of:
(A) solid style (B) dry stigma
(C) wet stigma (D) hollow style
[AIPMT 2015]

72. In a ring girdled plant:
(A) the root dies first
(B) the shoot and root die together
(C) neither root nor shoot will die
(D) the shoot dies first. **[AIPMT 2015]**

73. Tracheids differ from other tracheary elements in:
(A) having casparian strips
(B) being imperforate
(C) lacking nucleus
(D) being lignified. **[AIPMT 2014]**

74. Meristematic tissue responsible for increase in girth of tree trunk is:
(A) intercalary meristem
(B) lateral meristem
(C) phellogen
(D) apical meristem. **[NEET Karnataka 2013]**

75. Function of companion cells is:
(A) providing energy to sieve elements for active transport.
(B) providing water to phloem.
(C) loading of sucrose into sieve elements by passive transport.
(D) loading of sucrose into sieve elements.
[AIPMT Mains 2011]

76. The chief water conducting elements of xylem in gymnosperms are:
(A) vessels (B) fibres
(C) transfusion tissue (D) tracheids. **[AIPMT 2010]**

77. A common structural feature of vessel elements and sieve tube elements is:
(A) enucleate condition
(B) thick secondary walls
(C) pores on lateral walls
(D) presence of P-protein. **[AIPMT 2006]**

78. The length of different internodes in a culm of sugarcane is variable because of:
(A) shoot apical meristem
(B) position of axillary buds
(C) size of leaf lamina at the node below each internode
(D) intercalary meristem. **[AIPMT Screening 2008]**

79. In a woody dicotyledonous tree, which of the following parts will mainly consist of primary tissues?
(A) All parts
(B) Stem and root
(C) Flowers, fruits and leaves
(D) Shoot tips and root tips **[AIPMT 2005]**

80. The cells of the quiescent centre are characterised by:
(A) having dense cytoplasm and prominent nuclei.
(B) having light cytoplasm and small nuclei.
(C) dividing regularly to add to the corpus.
(D) dividing regularly to add to tunica. **[AIPMT 2003]**

81. The apical meristem of the root is present:
(A) only in radicals
(B) only in tap roots
(C) only in adventitious roots
(D) in all the roots. **[AIPMT 2003]**

82. Vessels are found in:
(A) all angiosperms and some gymnosperms.
(B) most of the angiosperms and few gymnosperms.
(C) all angiosperms, all gymnosperms and some pteridophytes.
(D) all pteridophytes. **[AIPMT 2002]**

83. Axillary bud and terminal bud are derived from the activity of:
(A) lateral meristem (B) intercalary meristem
(C) apical meristem (D) parenchyma.
[AIPMT 2002]

84. Which of the following statement is true?
(A) Vessels are multicellular and with wide lumen.
(B) Tracheids are multicellular and with narrow lumen.
(C) Vessels are unicellular and with narrow lumen.
(D) Tracheids are unicellular and with wide lumen.
[AIPMT 2002]

85. A leaf primordium grows into the adult leaf lamina by means of:
(A) apical meristem
(B) lateral meristem
(C) marginal meristem
(D) first by apical meristem and later largely by marginal meristem. **[AIPMT 1998]**

86. At maturity which of the following is enucleate?
(A) Sieve cell (B) Companion cell
(C) Palisade cell (D) Cortical cell
[AIPMT 1997]

87. What is not true about sclereids?
(A) These are parenchyma cells with thickened lignified walls.
(B) These are elongated and flexible with tapered ends.
(C) These are commonly found in the shells of nuts and in the pulp of guava, pear, *etc.*
(D) These are also called the stone cells. **[AIPMT 1996]**

88. Cork cambium and vascular cambium are:
(A) parts of secondary xylem and phloem
(B) parts of pericycle
(C) lateral meristems
(C) apical meristems. **[AIPMT 1995, 90]**

89. Bordered pits are found in:
(A) sieve cells (B) vessel wall
(C) companion cells (D) sieve tube wall.
[AIPMT 1993]

90. Angular collenchyma occurs in:
(A) *Cucurbita* (B) *Helianthus*
(C) *Althaea* (D) *Salvia.* **[AIPMT 1991]**

91. An organised and differentiated cellular structure having cytoplasm but no nucleus is:
(A) vessels (B) xylem parenchyma
(C) sieve tubes (D) tracheids **[AIPMT 1991]**

92. Collenchyma occurs in:
(A) herbaceous climbers (B) woody climbers
(C) climbing stems (D) water plants.
[AIPMT 1990]

93. For union between stock and scion in grafting which one is the first to occur?
(A) Formation of callus
(B) Production of plasmodesmata
(C) Differentiation of new vascular tissues
(D) Regeneration of cortex and epidermis
[AIPMT 1990]

94. Organisation of stem apex into corpus and tunica is determined mainly by:
(A) planes of cell division
(B) regions of meristematic activity
(C) rate of cell growth
(D) rate of shoot tip growth. **[AIPMT 1989]**

95. Sieve tubes are suited for translocation of food because they possess:
(A) bordered pits
(B) no ends walls
(C) broader lumen and perforated cross walls
(D) no protoplasm. **[AIPMT 1989]**

96. Which meristem helps in increasing girth?
(A) Lateral meristem (B) Intercalary meristem
(C) Primary meristem (D) Apical meristem
[AIPMT 1988]

97. Which one yields fibres?
(A) Coconut (B) Oak
(C) Teak (D) Sisso. **[AIPMT 1988]**

SOLUTIONS

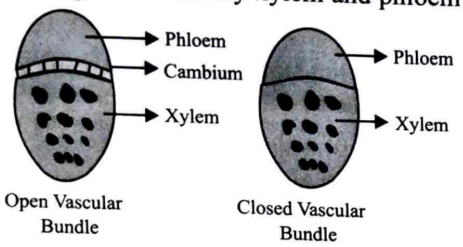
1. (D) In the given figure of stomata with bean-shaped guard cells, X - Epidermal cells, Y- Subsidiary cells, Z- Guard cells, W - Stomatal pore. The outer walls of guard cells (away from the stomatal pore) are thin and the inner walls (towards the stomatal pore) are highly thickened.

2. (B) In monocots, vascular bundles lacks meristematic tissue of cambium. They are not capable of forming the secondary xylem and phloem tissues and hence, secondary growth is absent. Therefore, monocots generally have closed vascular bundles.

Related Theory
In monocot stem, cambium is absent and thus, secondary growth in stem is absent. Stem is usually hollow and the vascular bundles in the stem are scattered and numerous. Vascular bundles are surrounded by a sclerenchymatous bundle sheath. Phloem parenchyma, pericycle and pith are absent.

3. (B) The stomata are bordered by two specialised epidermal cells - the guard cells, which in some cases are accompanied by subsidiary cells. The walls of guard cells are unevenly thickened. Each guard cell has thick, inelastic inner wall and thin, elastic outer wall, containing chloroplasts. Stomatal aperture is present in between the guard cells. Guard cells are not always surrounded by accessory cells or subsidiary cells.

4. (C) A closed vascular bundle means that there is an absence of cambium. They are not capable of forming the secondary xylem and phloem tissues.



Related Theory

Difference between open and closed vascular bundle:

	Open Vascular Bundle	Closed Vascular Bundle
(1)	Cambium is present between the xylem and phloem.	Cambium is absent.
(2)	It shows the ability of forming secondary xylem and phloem tissues.	It is not capable of forming the secondary xylem and phloem tissues.
(3)	It is found in dicotyledonous plants.	It is found in monocotyledonous plants.

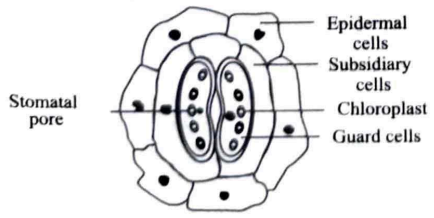
5. (A) The ground tissue system arises from a ground tissue meristem and consists of three simple tissues: parenchyma, collenchyma and sclerenchyma, except epidermis and vascular bundles.

Related Theory

The ground tissue is divided into three classes based on the nature of the cell walls. Parenchyma cells have thin primary walls and remain alive on maturation. Collenchyma cells have thin walls with some areas having secondary thickening. It provides additional structural support in regions of new growth. Sclerenchyma cells have thick secondary walls and is often dead. It provides the main structural support to a plant.

6. (C) Guard cells are specialised plant cells in the epidermis of leaves, stems and other organs that are used to control gas exchange. In the epidermal tissue, only guard cells contain chloroplasts.

7. (D) Structure of stomata:



Related Theory

Monocots contain dumb bell-shaped guard cells, surrounding their stomata. In contrast, dicots contain bean-shaped guard cells, surrounding the stomata. Monocots contain stomata in both upper and the lower epidermis of leaves. But, most dicot stomata occur in the lower epidermis.

8. (B) Dermatogen (outer layer): Gives rise to epiblema of root.

Periblem: (middle layer) Gives rise to cortex and endodermis.

Plerome: (inner layer): Gives rise to pericycle, pith and vascular tissue.

Phellogen (lateral meristem): Gives rise to cork cambium.

9. (C) The process by which the vascular tissues of plants namely xylem and phloem are formed is called vascularisation and the meristematic tissue involved in providing the primary tissues of the vascular system is called procambium. During the primary growth of the plants, the procambium is formed first followed by the formation of xylem and phloem.

10. (B) In dicotyledonous leaf, the abaxial epidermis generally bears more stomata than the adaxial epidermis.

11. (D) In monocots, during water stress, the bulliform cells in the leaves become flaccid, that makes the leaves curl inwards to minimise water loss.

12. (B) Secondary vascular tissues, *i.e.*, secondary xylem and phloem are formed by the vascular cambium. Phellogen is the meristematic cell layer responsible for the development of the periderm. The apical meristem is the growth region in plants found within the root tips and the tips of the new shoots and leaves. Axillary meristems allow the production of secondary growth axis in the shoot system of plants.

Related Theory

Vascular cambium is produced by two types of meristem: interfascicular and intrafascicular cambium. Intrafascicular cambium is a primary meristem, which occur as strips in vascular cambium. It divides to form secondary phloem on outer side and secondary xylem on the inner side. Interfascicular cambium arises secondarily from the cells of medullary rays.

13. (D) Casparian strips are found in the endodermis of the dicot roots. Cortex is found below epiblema, made of parenchymal cells. Epidermis is the outermost layer, made up of thin walled and flattened cells. Pericycle is found below endodermis, made up of parenchymatous cells.

Related Theory

Casparian bands are the bands of thickening, which runs along the radial and tangential walls of endodermis. It is made up of suberin and lignin. It prevent the plasmolysis of endodermal cells. They acts as a protective barrier against excessive water

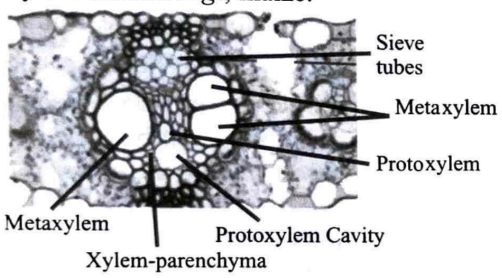
loss. Water and nutrients absorbed by the roots are blocked from entering the stele via the apoplastic route. As a result, solutes flow via the symplastic route. This is important so that there would be selective passage of solutes, especially when they might bring harm to the plant.

14. (A) Cortex is found between epidermis and stele. It is multi-layered and made of parenchymatous cell with intercellular spaces. Vascular bundles are present between endodermis and pith. Pericycle and endodermis are simultaneous layers. Pericycle is found between endodermis and vascular bundle.

Related Theory

Stele is referred as the unit of vascular system that is made up of xylem, phloem, interfascicular tissues, medullary rays, pericycle and pith (if present). It states to the central core of plant axis and is restricted only to primary tissues. It is the central part of the root or stem containing the tissues derived from the procambium.

15. (B) In monocot stem, vascular bundles are collateral and conjoint vascular bundles. In the vascular bundles, cambium is absent between xylem and phloem. So, these are called closed vascular bundles. In the xylem, protoxylem is towards the centre, and metaxylem is towards the periphery. So, it is an endarch xylem. In the protoxylem, some of the cells, disintegrate, and form a lysigenous cavity, called protoxylem lacuna. *E.g.*, maize.



Monocot Stem

16. (B) The vasculature is radial in dicot root, *i.e.*, xylem bundles alternate with phloem bundles. Usually, vascular bundles are 2-6 in number, while in monocot root the vascular strand consists of several (6 or more) alternate radial xylem and phloem bundles. Secondary growth takes place in dicot root, while absent in monocot roots, but annual rings do not form in both dicot and monocot roots.

17. (C) Xylem vessels are made up of a row of cells, placed one above the other, with their intervening walls absent or variously pored. The walls of vessels are lignified and hard, but not very thick. The cell cavity or the lumen is wide. The thickening may be annular, spiral, scalar form, reticulate or pitted.

18. (B) The vascular bundles in the stem of barley plant are scattered in ground tissues and vary in size-smaller towards periphery and bigger towards centre of the ground tissue, oval or rounded in outline, conjoint, collateral and closed.

Related Theory

In the dicot stem, the vascular bundles are conjoint, collateral and open. Vascular bundles of dicot stem are open, because of the presence of cambium. Radial vascular bundles are found in the dicot root.

Caution

In monocots, the vascular tissue is arranged in distinct bundles that are scattered throughout the stem. They are called closed vascular bundles due to absence of cambium thus they will not go on to form secondary tissues (no residual procambium). In monocot roots, the vascular bundles are arranged in a circular pattern.

19. (A) *Sorghum* (family-Poaceae) is a monocot plant. The leaves of monocot do not contain palisade parenchyma, because the mesophyll of monocot leaf is not differentiated into palisade and spongy parenchyma, all being thin walled, chlorophyllous and irregularly compactly arranged with fewer intercellular spaces.

Related Theory

Palisade parenchyma consists of columnar cells, which are compact and arranged tightly below the upper epidermis of a leaf, while spongy parenchyma consists of rounded cells, which are loosely arranged below the palisade parenchyma.

20. (A) Monocot root - many radial vascular bundles are present.
Dicot root - four radial vascular bundles are present.
Monocot stem - many collateral, conjoint, closed vascular bundles are present.
Dicot stem - many collateral, conjoint, open vascular bundles are present.

21. (A) In monocot stem, ground tissue is undifferentiated, therefore cortex, endodermis, pericycle and pith are not recognisable. Here, ground tissue consists of only parenchyma cells in which numerous vascular bundles are scattered.

Related Theory

The internal structure of a monocot stem mainly comprises a well-developed epidermis, hypodermis, ground tissue and numerous dispersed vascular bundles.

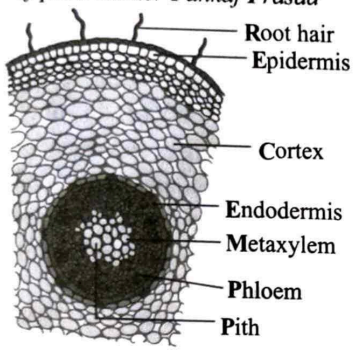
The internal structure of a dicot stem mainly consists of epidermis, hypodermis, cortex endodermis, pericycle, vascular strand and pith.

22. (D) Monocotyledonous stem has vascular bundles that are scattered throughout, surrounded by a sclerenchymatous bundle sheath, and a large and conspicuous parenchymatous ground tissue. The structure of the bundles is closed and conjoint. Phloem parenchyma is absent here because the vascular bundles lack cambium and are open, no secondary growth occurs.

23. (B) In the dicot root, the vascular cambium is completely secondary in origin, and it originates from a portion of the pericycle tissue above protoxylem and the tissues found beneath the phloem bundles. The cells of pericycle found against the protoxylem undergo division to form multiple layers of cells, which fuse through cambial cell resulting in the formation of a complete cambial ring.

Mnemonics

Different parts of dicot root can be memorised as:
***RECE**ption of paan **M**aker **P**ankaj **P**rasad*



Dicot Root

24. (B) Transition of radial vascular bundle in root to conjoint vascular bundle in stem occurs in transition zone, which is generally hypocotyl. Hypocotyl is the part of embryonal axis below the level of cotyledons.

25. (B) Casparian strips or bands are a cellular feature found in the roots of all higher plants. They are ring-like, hydrophobic cell wall impregnations. These impregnations occur in the endodermis, an inner cell layer that surrounds the central vascular strand of roots.

26. (B) Dicotyledoneae is the group of angiosperms with two cotyledons, flowers are bi or pentamerous, leaves are net-viened, stem with open collateral vascular bundle arranged in a ring and roots form tap root system.

27. (D) The large xylem vessels in the center are sandwiched between two layers of phloem (bicollateral bundle) that can be identified as groups of smaller cells above and below the xylem. Typical pairs of sieve tubes and smaller companion cells are found only in these parts of the vascular bundle.

28. (A) An intercalary meristem is the meristem present at the base of the internodes of stem or leaf. In monocots, such as in grasses it enables longitudinal growth of the leaves and in hollow stem or pulm of bamboo and sugarcane, it helps in increasing the length of the stems.

29. (C) The epidermis of dicot stems and petioles contains collenchyma, which is a supporting tissue and is widely distributed in climbing stems. In dicots, collenchyma may be found both above the petiole and within the cortex, which provides tensile strength.

30. (B) The tissue for of producing lateral roots is known as a pericycle. It aids in the roots secondary development. It is a continuous layer, however there are some monocots where xylem and phloem cut through the layer of pericycle. The primary functions of pericycle cells for the plant are support, structure, and defense. Pericycle cells encircle the xylem and phloem in the root.

31. (C) Monocot leaves tend to have parallel venation. Mesophyll in monocot leaves lie between the two layers of epidermis and is not differentiated in palisade and spongy tissues. Bulliform cells or motor cells are large, bubble-shaped epidermal cells that occur in groups on the upper surface of the leaves of many monocots.

32. (B) Endarch and exarch are the terms used to describe the arrangement of primary xylem elements, and not recondary xylem. In endarch condition, the protoxylem is located towards the center of the stem, and the metaxylem is located towards the periphery. In exarch condition, the protoxylem is located towards the periphery of the stem, and the metaxylem is located towards the centre.

The exarch condition is mainly found in the roots of the plants as in roots the protoxylem is located towards the periphery of the root and metaxylem is located towards the centre.

33. (C) Late wood has fewer xylary elements with narrow vessels. This statement is true. Late wood, which is the densest part of the tree ring, is characterised by narrower vessels and thicker cell walls, which results in fewer xylary elements than early wood.

Cambium is less active in winters. The cambium is a layer of cells in a tree that is responsible for producing new xylem and phloem cells. During the winter, the cambium is less active because of the colder temperatures, which can cause the cells to become dormant until the spring.

34. (D) Lenticels are small, lens-shaped pores in the bark of stems and roots that allow for gas exchange between the internal tissues and the atmosphere.

Bark is the protective outermost layer of a woody stem or root, consisting of several layers including the phloem, cork cambium (phellogen), and cork (phelloderm). The periderm and secondary phloem are part of the bark.

35. (D) In older trees the greater part of secondary xylem is dark brown due to deposition of tannins, resins, oils, gums, aromatic substances and essential oils in the central layers of the stem. These substances make it hard durable and resistant to the attacks of micro-organisms and insects.

36. (A) Springwood is also called early wood because it is formed during the spring season. It is lighter in color and has a lower density. The spring and autumn wood appear as alternate concentric rings of light and dark color forming annual rings.

37. (B) Lenticels are the pores present in woody stems. They help in exchange of gases. Cork cambium is also known as phellogen. The parenchymatous tissue that arises from the phellogen's inner surface known as secondary cortex, is also called phelloderm. The walls of cork cells have a suberin deposition and are water resistant.

38. (C) Interfascicular cambium is a cambium found in between vascular bundles. It forms the secondary meristems. The interfascicular and fascicular cambium unite forming a continuous ring of meristematic tissue known as vascular cambium.

Related Theory

The stele consists of vascular tissue, ground tissue or pith, and a pericycle. The pericycle mainly forms the outermost boundary of the stele. Therefore, the stele can be explained as the vascular bundle. The stele is composed of mainly three tissues, i.e., the pericycle, the xylem, and the phloem.

Caution

Students should remember that interfascicular cambium occur only in those plants that produce the woody axis or show secondary growth. These are generally not present from the very beginning of life of a plant and appear later than the primary meristems, that is why they are called secondary meristems.

39. (D) Due to non-uniform environmental conditions throughout the year, annual rings are prominent in trees of temperate regions. Cambium is quite active in spring and less active in winter.

40. (C) Secondary growth is due to the presence of vascular cambium. Grasses are monocots and hence, lacks vascular cambium. Therefore, they do not show secondary growth. Deciduous angiosperms are usually woody dicot plants, and show secondary growth. Conifers and cycads are gymnosperms and show anomalous secondary growth.

Related Theory

Secondary meristems allow growth in diameter (secondary growth) in woody plants. Herbaceous plants do not have secondary growth.

41. (C) Heartwood (or duramen) is the central dead wood, which comprises of dead lignified cells containing organic compounds, *e.g.*, tannin and other substances. These substances provides a dark colour to the wood. They are strong and durable and resistant to decay. It does not conduct water and minerals because of the presence of dead elements.

Related Theory

Sapwood (or alburnum) is the outer layer of a branch or limb that is still living. It is usually lighter in colour and is very moist. Sapwood is the living part of a tree where the sap and water flow. All wood initially grows as sapwood.

Caution

The conduction of water and minerals is carried out by sapwood, because it contains living cells.

42. (C) Phellem or cork is a tissue formed on the outer side of the cork cambium. It is composed of dead cells and is impermeable to water due to suberisation. Xylem parenchyma is the only xylary element, which consists of living cells. Collenchyma are living cells having thick deposits of cellulose in their cell walls. Phloem are living components of vascular bundles.

Caution

Students confuse between xylem and parenchyma. However, in xylary elements, tracheids, vessels and fibres are non-living components, while parenchyma are living. Phloem consists of living components like companion cells, sieve tube cells and parenchymal cells, but phloem fibres (or bast fibres) are dead elements.

43. (C) Vascular cambium is located between xylem and phloem. It give rise to secondary xylem towards pith and secondary phloem towards bark. Phellogen is made of narrow thin walled cells. They cut off cells on both sides. The outer cells differentiate into phellem or cork and inner cell differentiate into secondary cortex or phelloderm. They are collectively known as periderm.

44. (C) Tyloses are balloon-like outgrowth of parenchymatous cells to the lumen of tracheids or vessels of the secondary xylem. Tyloses prevent the flow of sap through the vessels and also the movement of fungal hyphae and prevent spreading of diseases. The sap movement takes place through the newly formed secondary vessel elements. Tyloses are also known to occur in the sap wood beneath the wounds as well as in connection with some diseases.

Related Theory

Tyloses are the enlarged protrusions of the pit membranes of the half-bordered pits from a living parenchyma cell into a vessel or a tracheid lumen. They are so large that the lumen of the vessel or tracheid is almost blocked. A tylosis contains a nucleus with a certain amount of cytoplasm coming from the living cell. Starch, resin and other matters may also be present in it. The initial thin walls of tyloses may undergo lignification later leading to the formation of sclereids.

45. (B) Lenticels in plants are involved in the gaseous exchange. They are found in bark of woody stems and roots. Transpiration occurs from the aerial parts of the plants, such as leaves. Food transport occurs through phloem. Photosynthesis occurs in green parts of the plants containing chlorophyll.

Related Theory

➥ *A lenticel is a porous tissue comprising cells with huge intercellular spaces, found in the roots, the bark and periderm of secondarily thickened structures. Lenticels act as pores, for direct exchange of gases between the atmosphere and internal tissues.*

➥ *Lenticels contribute to 0.1 percent to overall transpiration, which is negligible.*

46. (C) The age of a tree can be estimated by the number of annual rings. This method is called dendrochronology. It is the scientific method of dating tree rings. In one year, two bands of secondary xylem are produced, viz., springwood and autumn wood. These two bands make for an autumn ring.

Related Theory

➥ *Trees typically grow one ring per year. They start growing in the spring (the cells are light tan in colour, known as early wood) and, as the growing season ends in the fall, the cell walls thicken (the dark band or late wood) and eventually stop growing in the winter causing a very distinct ring. The ring pattern that forms over the entire life of the tree reveals the climatic conditions in which the tree grew.*

47. (B) The cork cambium or phellogen is few layers thick and it cut off cells into outer layer and inner layer. The outer layer differentiates into cork (phellem), while inner layer differentiate into secondary cortex (phelloderm). Xylem is the conducting tissue for water and minerals. The vascular cambium produces secondary xylem inwards, towards the pith, and secondary phloem outwards, towards the bark.

Related Theory

➥ *In woody trees, the phellogen cut off closely arranged parenchymatous cells, rupturing the epidermal cell to form lenticels.*

48. (D) Cells called xylem fibers, which offer mechanical support, have walls that are significantly thicker and lack central lumens. Gymnosperms are referred to as soft-wood because they lack xylem fibers.

49. (C) Heartwood and sapwood are two distinct forms of wood found in older woody trees. The heartwood is composed of dead xylem vessels that have been filled with tyloses and are rich in resin and tannin deposits. These are unusable and are darker. The sapwood contains newly created functioning vessels that seem lighter. The heartwood protects wood against pest attack while also increasing its durability. It has no role whatsoever in the conduction of water.

50. (A) Secondary growth is characterised by an increase in thickness or girth of the plant caused by cell division in lateral meristem.

Related Theory

➥ *Secondary growth in vascular plants takes place due to the activity of the two lateral meristems-cork cambium and vascular cambium.*

51. (A) Cork cambium is a meristematic tissue involved in secondary growth. It is also called phellogen. It develops in the hypodermal region or the region just outside the general cortex. The former differentiates into cork (phellem), while the latter differentiate into secondary cortex (phelloderm). All these three layers phellogen, phellem and phelloderm are collectively called as periderm. In woody trees, the phellogen cut off closely arranged parenchymatous cells, rupturing the epidermal cell to form lenticels.

52. (C) Pollen exine is formed of sporopollenin. It is resistant to acids and alkali and cannot be degraded by any enzyme.

53. (A) Teak and pine is most suitable for the study of critical secondary growth because in secondary growth, secondary tissues are formed from lateral meristem which is well developed in these two cases and secondary growth occurs in gymnosperms and dicots. Wheat and sugarcane are monocots, maiden hair fern and fern are pteridophytes; deodar and sunflower are dicots.

54. (A) In ectophloic siphonostele, the central pith is surrounded successively by xylem, phloem, pericycle and endodermis. It is found in *Osmunda* and *Equisetum*.

55. (D) Vessels are of equal diameters and are uniformly distributed throughout the ring, and the porous wood is known as diffuse porous wood. It is characteristic of plants growing in tropics.

56. (D) Phellogen, often known as cork cambium, is a secondary meristem that causes dicotyledonous stem and root to generate additional stelar secondary growth.

57. (A) The outermost, younger layer, which contains living cells is called sapwood. It is a living wood and its principal function is to conduct water from the roots to the leaves. Sapwood is prone to attack of pathogens and insects if exposed. So it can easily undergo decomposition, when exposed to insects and pathogens.

Related Theory

➥ *Sapwood is the living, outermost portion of a woody stem, while heartwood is the dead, inner wood, which often comprises the majority of a stem's cross-section. We can easily distinguish sapwood from heartwood by its colour.*

58. (A) Plants like *Dracaena* show secondary growth by a special cambium. It develops in the form of strips just outside the vascular region. These cambial strips produce secondary vascular bundles, which is amphivasal in *Dracaena*.

Related Theory

➥ *In some plants, the pattern of the secondary growth shows deviation from the normal type. This deviation or variation is*

known as anomalous secondary growth. Anomalous secondary growth is not an anomaly or disease in plants; rather it is an adaptation to suit the habit and habitat of the plant.

59. (C) In ring-porous woods, the vessels laid down at the beginning of the growing season are much larger than vessels laid down at the end of the season. Diffuse porous woods form the vessels of almost the same radial diameter throughout the growing season.

60. (C) Phellogen aids in the formation of periderm. On the outside and inside, it creates phelloderm and phellem, respectively. Phellem (cork), phellogen (cork cambium), and phelloderm are the three primary layers that make up the periderm. The cambium breaks down the outer epidermal layer and the cortical layer during secondary growth.

61. (B) Primary growth is controlled by root and shoot apical meristems, while secondary growth is controlled by two lateral meristems called vascular and the cork cambium. The vascular cambium is responsible for the formation of secondary xylem and phloem.

Related Theory

- *Cambial ring becomes active and starts cutting new cells both the inner and outer side. The new cells produced towards the pith develop into secondary xylem and new cells produced towards periphery develop into secondary phloem.*

62. (C) Commercial cork is derived from the periderm layers of a *Quercus* suber plant (cork oak tree).

63. (A) The cortex of a dicot stem's parenchyma dedifferentiates to generate the cork cambium (phellogen), a ring of meristematic tissue. It creates secondary cortex or phelloderm on the inner side and cork or phellem on the outside.

64. (A) Sclereids are the spherical, cylindrical or oval cells with very narrow lumen; these cells are usually found in the fruit walls of nuts, pulp of fruits like pear, guava, and seed coats of legumes and tea leaves. The sclereids gives the gritty texture to pear and guava.

Related Theory

- *Fibres are elongated cells which are responsible for providing the support to the plants.*
- *Parenchyma are living cells, which are meant for storing of food and provide rigidity to the plant.*
- *Collenchyma is consider as supporting tissue of plants.*

65. (D) Vessels are absent in gymnosperms, with the exception of Gnetophytes, as they possess vessels.

66. (D) Companion cells helps in maintenance of the pressure gradient in sieve tubes as these cells are parenchymatous which are closely connected with the sieve tubes elements. Albuminous cells are primarily perform the loading and unloading of sugars into the cavity of sieve cells throughout the plant system, organic compounds are conducted by sieve cells. Phloem parenchyma has the role in storage of food and other substances.

67. (C) Both parenchyma and collenchyma are living tissues. Gymnosperms lack vessels in their xylem. The presence of vessels is a characteristic feature of flowering plants, *i.e.*, angiosperms. Vessels are the main water transporting elements.

68. (A) Meristematic tissue contain cells with active cell division capacity. These are found in growing regions of plant like root and shoot tips.

Tissue having all cells similar in structure and function are simple tissues. Example: Parenchyma, sclerenchyma and collenchyma.

Tissue having different types of cells are complex tissue. Examples are vascular tissue-xylem and phloem.

Dead cells with highly thickened walls and narrow lumen are known as sclereids.

69. (D) This is because intercalary meristems are found in grasses, where they help to regenerate the parts removed by the grazing herbivores.

70. (D) Gymnosperms do not have companion cells and sieve tubes in their phloem. They only have sieve cells for food material transmission, and they also have albuminous cells with functions similar to partner cells.

71. (A) Transmission tissues are specialised tissues present in the solid style of the carpel of the flower. This transmission tissue helps in fertilisation of male and female gametes through making a pollen tube, which connects the stigma of the flower with the inside of the ovary.

72. (A) In a ring girdled plant, the root dies first, and not both shoot and root die together. Girdling is defined as a process of ring-barking, wherein a complete strip of tree bark is removed from its entire circumference of either a tree trunk or a bark of a woody plant.

73. (B) Tracheids are elongated, dead cells with hard lignified walls, have wide lumens and narrow walls with spiral, annular, reticulate, scalariform and pitted thickening but without perforated end walls of septa. However, vessels are long cylindrical tubular structures made of many cells, each with lignified walls and a large central cavity. Vessel members are interconnected through perforation in their common walls.

Related Theory

- *The tracheary elements of the xylem are the tracheids and the xylem vessels. A tracheid is a tubular cell whose primary function is to conduct water and mineral salts, provide*

structural support, and prevent air embolism in vascular plants. A xylem vessel is a series of cells arranged in a way that enables rapid and more efficient water and mineral conduction in most angiosperms.

Caution

➥ *Students should remember that in pteridophytes and most gymnosperms, the tracheid is the major conductive tissue and xylem vessel is absent. Most angiosperms have both tracheid, and xylem vessels, and the xylem vessels are their main conductive tissue.*

74. (B) Lateral meristem are present along the lateral sides of stem and roots, and are responsible for lateral growth of trees. Intercalary meristem is associated with the growth in length in the middle position, causing internodal elongation. Phellogen also known as cork cambium is the meristematic plant tissue responsible for the formation of the periderm. Apical meristem is involved in the growth region in plants found within the root tips and the tips of the new shoots and leaves.

Related Theory

➥ *When plant breeders want to regenerate plants that are virus-free using asexual multiplication (in order to obtain clones of the primary unhealthy plant), they often collect the apical meristem from the infected plant, and cultivate it in an appropriate media, so that a new, complete and virus-free plantlet develops. High metabolic processes (Enzyme activity); High concentration of auxin and cytokinin hormone (Low pH); cell multiplication rate of and very small size of plasmodesmata prevent the movement of the virus from one cell to another cell.*

75. (D) Companion cells move sugar and amino acids into and out of the sieve elements. In source tissue such as leaf, companion cells use transmembrane proteins to take up sugar and amino acids by active transport. Movement of sugars in the phloem begins at the source, where sugars are loaded (actively transported) into a sieve tube. Loading sets up a water potential gradient that facilitates movement of sugar.

Related Theory

➥ *The companion cells are specialised parenchyma cells in the phloem tissues of the angiosperms. They are nucleated living cells with several ribosomes, plastids, and mitochondria. Their nuclei and nucleoli are relatively large (an indication of being metabolically active). They are present only in angiosperm, except Austrobaileya. Sieve tubes and companion cells are connected by pits, present in longitudinal walls.*

76. (D) Tracheids are the chief water-conducting components of the xylem of gymnosperms.

77. (A) Enucleate condition means cells without nuclei. This is found in vessel elements and sieve tube elements. Thick secondary wall is the inner most layer of cell wall, it is found in the cell wall of vessel elements. The thickened areas present on the lateral walls of the vessel elements are called pores. P-proteins are the small tubular fibrillar, granular or crystalline sub microscopic structures that appear in the cytoplasm of sieve tubes.

Caution

➥ *Xylem vessels become dead and lose their protoplasm due to deposition of lignified secondary wall, mature sieve tube elements are living cells without nucleus.*

78. (D) Intercalary meristem occurs at the base of the internodes or at the base of nodes or leaf. Their main function is to provide elongation and growth of that part of the plant where they are present. In grasses, the intercalary meristem regenerates parts removed by the grazing herbivores. Apical meristems increase the length of plant and are present at the apex of the stem.

79. (C) The tissues that develop from apical meristem and procambium are known as primary tissues and these constitute the primary structures of the plant body. The development of the primary tissues causes the stem to grow in length and to some extent in thickness. Stem and root in dicotyledons show secondary growth as they have development of secondary vascular tissues (*i.e.*, secondary xylem and secondary phloem) in them. Flowers, fruits and leaves are primary tissues.

80. (B) According to Quiescent Centre Theory, root apical meristem is present as the tip of main root and has a biconvex quiescent centre in its centre, which is characterised by presence of inactive cells with less number of cell organelles, light cytoplasm, small nuclei and low synthesis of DNA, RNA and protein caused by low frequency of cell division, *i.e.*, mitosis.

Related Theory

➥ *Behind the root cap is the quiescent centre, a region of inactive cells. They function to replace the meristematic cells of the root cap meristem. The quiescent centre is also important in organising the patterns of primary growth in the root.*

81. (D) Apical meristem is terminal in position and responsible for terminal growth of the plant. Apical meristem is present in all root tips and shoot tips.

Related Theory

➥ *If the apical meristem is removed by removing the end of the stem, the lateral buds will be released from apical dominance, and greater branching results. Eventually, one of the lateral meristems will grow more than the others and will impose apical dominance, becoming the new apical meristem.*

82. (B) Vessels are typically found in most of the flowering plants that are angiosperms and absent in most gymnosperms.

Related Theory

➥ *Gnetophyta is an odd group of species belonging to gymnosperms. Most gymnosperms do not possess vessels*

in their xylem as opposed to angiosperms, which have both tracheids and vessels. However, gnetophytes belonging to gymnosperms are an exception. They possess vessels.

83. (C) The apical meristem is responsible for axillary and terminal bud formation. The apical meristem is the growth in a plant, which seems at the root tip of young shoots and leaves.

Related Theory

The apical meristem is also recognised as a growing tip. The main aspect is to initiate the operation of new cell formation in new seedlings at the hints of roots and shoots, which ultimately contributes to forming the buds. It help in raising the height and length of the plant.

84. (A) Vessels are multicellular and with wide lumen. They are made up of vessel elements lying one above the other. The wall of vessels is hard but not thick having wide lumen, whereas tracheids are unicellular with narrow lumen.

85. (D) A leaf primordium grows into the adult leaf lamina by means of apical meristem initially and later by marginal meristems.

Related Theory

Plants contains three types of meristems, the apical meristem, the intercalary meristem and the lateral meristem. Leaves are derived from shoot apical meristem, which swells to form undifferentiated leaf primordium, which takes part in formation of leaf blades and leaf sheaths on cell division. The growth of leaf blade occurs due to cells division but is mainly from cell elongation. The flattened blade form is derived from the marginal meristem present at the margins of leaf axis.

86. (A) Through plasmodesmata, sieve tube cells are connected to the partner cells in a tight manner. At first, they have a nucleus, but as they mature, they shed it along with their ribosomes and vacuoles, and they differentiate in order to transport food. Through the plasmodesmata, the nuclei of the companion cells regulate the actions of the sieve tube cells. As a result, the mature sieve tube cells are enucleated yet still maintain their viability.

87. (A) Sclereids are broad sclerenchyma cells, which may be oval, spherical, cylindrical, or stellate in structure.

88. (C) All woody plants have lateral meristems, also known as secondary meristems, which are made up of the vascular cambium and the cork cambium.

They enable a plant's girth expansion, increasing its size. Secondary growth is the name for this form of development in vascular plants.

89. (B) Bordered pits are voids in the lignified cell walls of xylem conduits (vessels and tracheids), which are crucial elements in the water-transport system of higher plants. They are frequently seen in the vessels of angiosperms and tracheids of gymnosperms and ferns.

90. (A) In *Cucurbita*, angular collenchyma is found. A kind of plant tissue called collenchyma has uniformly thickened main walls and is made up of elongated, homogeneous cells. It offers the plant mechanical assistance.

91. (C) Sieve cells and sieve tube components have thin walls and are living. Enucleated live cells make up the mature sieve tube components. Each sieve cell or sieve tube component contains a core vacuole, and a thin layer of cytoplasm surrounds the central vacuole. Tracheids and mature xylem vessels are composed of dormant cells without protoplasm. The cytoplasm and nucleus of living cells make up the xylem parenchyma.

Related Theory

The main function of phloem is to conduct food materials, usually from the leaf to other plant parts (e.g., storage organ and growing regions).

92. (C) A tissue comprised of living, elongated cells with irregular cell walls is called collenchyma. Collenchyma can be found in the epidermis of dicot stems, petioles, in climbing stems.

93. (A) Grafting is the technique of fusing a tissue or a tiny portion into the tissues of another plant. The plant into which the foreign portion is placed is referred to as the scion, and the implanted tissue or part is known as stock. Initially, a collection of cells is created throughout this procedure. It is known as a callus.

94. (A) The Tunica Corpus Theory was proposed by Schmidt in 1924. This theory is relevant only to shoot apex. It is based on the plane of division of cells. According to this theory, the shoot apex consists of two distinct layers, namely, tunica and corpus.

95. (C) Sieve tubes function as the food conducting elements of phloem, which are elongated tubular channels formed by end to end union of numerous cells. Sieve tubes have lignified cell wall, broad lumen and perforated cross walls for the conduction of food.

96. (A) Lateral meristem stimulates the increase in the girth of stem and root. It increases the lateral thickness of the plant stem and root. Hence, lateral meristem helps in increasing the girth.

97. (A) Coconut fibre, obtained from both ripe and unripe coconut, is a natural fibre extracted from the husk of coconut.