Question-1

What is Coleorhiza?

Solution:
Coleorhiza is the protective covering of the radicle in a cotyledon.

Question-2

How is a cambial ring formed in dicotyledonous roots?

Solution:
Perennial dicotyledonous roots show secondary growth due to secondary meristems. Some parenchymatous cells in the phloem become meristematic. They divide and form cambium strips. External to the xylem, a cambial ring is formed. This lies on the inner side of the phloem. The cells cut-off from the cambium on the inner and outer sides. The inner side cells form the secondary xylem while the outer side cells of the cambium form the secondary phloem. The primary phloem then moves to the outside and the cambium forms a complete ring.

Question-3

What is heartwood? Mention any three of its characters.

Solution:
Heartwood refers to the hard central region of a tree trunk, which is made up of xylem vessels.
The three characteristics of heart wood are as follows

(i) It is non-functional.

(ii) It is dark coloured and filled with resins, tenins, etc.

(iii) It does not help in the conduction of water and minerals.

Question-4

Write the difference between sieve tubes and sieve cells.

Solution:

The difference between sieve tubes and sieve cells are as follows:

Sieve tube	Sieve cells
(i) Sieve tubes possess well-marked and differentiated areas.	(i) In sieve cells, sieve areas are less marked and unspecialized.
(ii) They are found in angiosperms.	(ii) They are found in gymnosperms.
(iii) Companion cells are present.	(iii) Companion cells are absent

Question-5

What is quiescent centre? Where is it located? Why is it so named?

Solution:

In plants, few cells occupying the central part of the distal region of the root apex undergo very slow mitotic activity when compared to other meristematic cells. This central, less active part of the root apex is called quiescent centre. It is named so because in the quiescent centre, low rate of mitosis occurs due to presence of less proteins.

Question-6

How do root tips manage to penetrate into the hard core of the soil?

Solution:

The root cap acts as a buffer between the soil and apical meristem. The roots let out root hairs from the region just behind the zone of elongation. Through, these, water and minerals are absorbed. They are short-lived and are replaced continuously. The root tip is covered by a root cap. The cells of the root cap secrete a mucilaginous substance that acts as a lubricant. This adaptation helps the tender root tips to enter the hard crust of the soil.

Question-7

Differentiate between monocot and dicot roots.

Solution:

Listed below are the differences between monocot and dicot roots

Monocot Roots	Dicot Roots
(i) The pith in monocot is large in size.	(i) The pith in dicot is small in size.
(ii) There is no secondary growth.	(ii) There is secondary growth.
(iii) The roots are generally polyarch.	(iii) The roots are diarch or tetrarch.
(iv) The metaxylem vessels are generally oval or spherical in shape.	(iv) The metaxylem vessels are generally polygonal in shape.
(v) The pericycle may be parenchymatous or even sclerenchymatous and gives rise to lateral roots.	(v) The pericycle forms a part of the cambium and cork cambium besides giving rise to the lateral roots.

Question-8

What are the functions of tracheids?

Solution:

Tracheids transport water and give mechanical support to the tree.

Question-9

What are sieve elements?

Solution:

Sieve elements are parts of the phloem. They are of two types

(i) Sieve cells

(ii) Sieve tubes.

Sieve cells are present in pteridophytes and gymnosperms. In angiosperms, sieve tubes are found. Many sieve cells are connected to each other in order to form a channel. There are sieve plates on the end walls. Sieve elements are meant for the translocation and conduction of food materials.

Question-10

What are the different regions of a root? Explain.

Solution:

The different regions of a root are listed below

(i) Root cap

The cap-like covering on the root apex protects the root tip. It has a tissue called calyptrogens.

(ii) Region of meristematic cells

Actively dividing cells form a small region called apical meristem at the root tip. Apical meristem of the root tip consists of three zones

(a) Dermatogen

This is the outermost layer of cells, which make up the epidermis and root cap.

(b) Periblem

It lies inner to the dermatogen. Its cells divide to form the cortex.

(c) Plerome

It is the innermost layer of cells of the apical meristem. Its cells divide to form the phloem and xylem.

(iii) Region of elongation

The cells of this region absorb water. The cells elongate in this region.

(iv) Region of maturation

It has fully developed cells. There are two regions; with root hairs and without root hairs. Lateral roots arise from this part. It helps in conduction of water and raw materials. It fixes the plant to the soil.

Question-11

Describe the epidermis of the stem of a dicotyledonous plant and mention its functions.

Solution:

The epidermis consists of a single layer of living cells, which are closely packed. The walls are thickened and covered with a thin waterproof layer called the cuticle. Stomata with guard cells are found in the epidermis. In some stems either unicellular or multi cellular hair-like outgrowths, trichomes, appear from the epidermis.

Functions

The epidermis protects the underlying tissues.

The cuticle prevents the desiccation of inner tissues and thus prevents water loss.

The stomata allow gaseous exchange for the processes of respiration and photosynthesis.

Question-12

What is ground tissue?

Solution:

Ground Tissue is the region, which is composed of small, thick-walled sclerenchyma on the inside of the epidermis. These layers of cells are followed by larger thin-walled parenchyma cells. Intercellular air spaces are found in the parenchyma. A cortex or pith is absent.

Question-13

Distinguish between the vascular bundle of a Monocotyledon and a Dicotyledon plant.

Solution:

Monocotyledon	Dicotyledon
1. A large number of vascular bundles are present.	1. A limited number of vascular bundles are present.
2. The vascular bundles are scattered in the ground tissue.	2. The vascular bundles are arranged in a ring.
3. No cambium occurs between the xylem and phloem.	3. Cambium occurs between the xylem and phloem.
4. There is no distinction between the cortex and pith.	4. The cortex and pith can be clearly distinguished.
5. No Secondary thickening.	5. Secondary thickening can occur.
6. No annual rings are formed.	6. Annual rings are formed due to secondary thickening.

Question-14

Describe the typical foliage leaf.

Solution:

A typical foliage leaf consists of a large, flat leaf blade (lamina), a petiole (leaf stalk) and a leaf base with which the leaf is attached to the stem. The veins are clearly visible on the leaf blade. The way in which the veins are arranged is known as venation of the leaf. The leaf blades of some plants show indentations or clefts. If these indentations reach all the way to the midrib so that the leaf blade is divided into a number of smaller pinnae (leaflets), the leaf is called a compound leaf. If the leaf blade is not divided into leaflets, the leaf is termed a simple leaf. Most monocots have simple leaves, while dicots can have simple or compound leaves.

Question-15

What is procambium and mention its role in plants?

Solution:

The procambium is the meristematic tissue that produces the primary vascular tissues: xylem and phloem. It develops directly beneath the growing tip next to new leaf primordial. The development of new leaves is thus tightly connected with that of new vascular tissues. The vascular tissues of leaves are also called leaf veins. The cells of the procambium are generally combined in cords. They form an extension of the vascular tissues into the growing tip and do thus provide the connection of the newly developed organ with the conductive systems of the plant. The cells of the procambium are elongated and become even more so in the course of their development. The volume of their vacuoles increases considerably, lending them a lighter and more transparent appearance than their neighbouring cells. This is decisive for their differentiation into xylem or phloem cells.

Question-16

Explain collenchyma.

Solution:

Collenchyma's is closely related to parenchyma. However, the plastids are not well differentiated in collenchymas while they are well differentiated and obvious in parenchyma. Collenchymas always occurs just beneath the epidermis, while parenchyma occurs throughout the plant. Collenchymas cell walls are unevenly thickened. When the thickening occurs at the corners where cells are joined it is called angular. Lamellar collenchyma's has thickenings on their tangential walls, which are parallel with the surface.

Lignin is usually not present in collenchymas.

Question-17

What are the three primary meristems in the shoot apical meristem?

Solution:

The shoot apical meristem gives rise to three primary meristems

Protoderm - gives rise to the epidermis, the outer, protective coating of the plant.

Procambium - gives rise to the vascular tissue.

Ground meristem - gives rise to ground tissue.

Question-18

How do Meristematic cells divide?

Solution:

Meristematic cells may divide in one of two ways

Periclinal

Cell division results in the formation of two cells, one towards the inside and one towards the outside.

Secondary xylem and phloem are produced through periclinal divisions of the vascular cambium and their derivatives, i.e. the cell plate that forms between the dividing initials is parallel to the surface of the root or stem. Those divided towards the inside become xylem cells and those to the outside become phloem cells.

Anticlinal

Cell division results in the formation of two cells, side by side.

As the vascular cambium adds cells to the secondary xylem and the core of the xylem increases in width, the cambium is displaced outward. The vascular cambium undergoes an increase in circumference via anticlinal divisions of the initials.

Question-19

What are the three basic arrangements of the primary vascular tissues and ground tissues in plants?

Solution:

The three basic arrangements of the primary vascular tissues and ground tissues found in plants are

(i) The primary vascular tissues may appear as a more or less continuous hollow cylinder, which divides the ground tissue into two regions. The outer region is known as the cortex and the inner region is known as the pith.

This pattern is observed in conifers and dicots that undergo secondary growth. Between the primary xylem and primary phloem there is a layer of residual procambium that remains meristematic which gives rise to the vascular cambium.

(ii) The primary vascular tissues may develop as discrete vascular bundles located towards the periphery of the stem. The vascular bundles are separated from each other by ground tissue. The region between the epidermis and the vascular bundles is the cortex and the region inside the vascular bundles is the pith. This is the arrangement found in most herbaceous dicots. The ground tissue separating the strands is called interfascicular parenchyma (between the bundles). In plants that do not undergo secondary growth (herbs) a complete bundle sheath of sclerenchyma cells (fibers) forms around the vascular strands. The procambium loses its ability to divide once the primary vascular tissues are formed. Therefore, the potential for secondary growth within the bundle is lost. Such vascular bundles are called closed vascular bundles. Vascular bundles that lack complete bundle sheaths are open. In these plants fibers are usually present only at the outer edge of the vascular bundles. The procambium retains the ability to divide and produce secondary vascular tissue. An interfascicular cambium will develop to "round out the stem".

(iii) The primary vascular tissues may develop a complex arrangement with the vascular bundles scattered throughout the ground tissue. Since the vascular bundles are scattered, there is no cortex and pith, only ground tissue. This arrangement is characteristics of most monocots. As in all monocots, the vascular bundles are closed so no secondary growth can occur.

Question-20

Write a note on woody stems.

Solution:

Woody stems are hard and stiff. Plants, which can grow many seasons, have woody stems. With time the stem becomes very hard and rigid due to secondary growth. The terminal buds and auxiliary buds have hard productive scales covering them. Examples of woody plants are trees and shrubs. Since woody plants drop their leaves during certain seasons the stems will have leaf scars. Above each leaf scar are auxiliary buds. The terminal bud will lose its bud scales each spring when the terminal buds grow in length. Thus terminal buds scale scars are left of the stem. The age of a woody twig can be determined by the number of terminal bud scars present on a stem.