

Axillary bud

Shoot apical meristem

Intrafascicular cambium

Primary lateral  
meristem

Interfascicular  
cambium, cork  
cambium

Secondary lateral  
meristem

Bark

Includes secondary phloem and periderm

Periderm

Phellem (cork)

Phellogen (cork cambium)

Phelloderm (secondary cortex)

Bulliform cells

Modified adaxial epidermal cells in grasses

## Parenchyma

Isodiametric, thin cellulose cell wall.

Photosynthesis, storage and secretion

## Collenchyma

Present below epidermis in dicotyledonous plants.

No intercellular spaces, thickened corner due to cellulose, hemicellulose and pectin deposition.

## Sclerids

Present in fruit walls of nuts, pulp of fruits (guava, pear, sapota), seed coat of legumes and tea leaves

Xylem vessels

Multicellular, absent  
in gymnosperms

Xylem tracheids

Unicellular,  
elongated with  
tapering ends and  
lignified wall

Endarch primary  
xylem

Stem

Exarch primary  
xylem

Root

Ray parenchymatous  
cells

Radial conduction  
of water

Phloem of  
gymnosperms

Lack sieve tubes  
and companion  
cells.  
Contain albuminous  
and sieve cells.

Companion cells

Specialised parenchymatous cells and help in maintaining pressure gradient in sieve tubes

Phloem parenchyma

Plasmodesmata connections between the cells.

Absent in most of the monocots

Root hairs

Unicellular elongations of epidermal cell

Trichomes

Epidermal hairs on  
the stem

Dicot root

Vascular bundles-  
Radial, diarch to  
tetrarch, small pith

Monocot root

Vascular bundles-  
Radial, polyarch large  
pith.

No secondary growth.

**Dicot stem**

Hypodermis- Collenchymatous

Endodermis- Starch sheath

Pericycle- Semi-lunar patches of sclerenchyma

Vascular bundles- Conjoint, collateral, open and arranged in a ring

**Monocot stem**

Hypodermis- Sclerenchymatous

Bundle sheath- Surrounds each vascular bundle

Vascular bundles- Conjoint, collateral, closed (no cambium) and scattered

**Dicot leaf**

Dorsiventral, more stomata on abaxial surface.

Mesophyll- palisade parenchyma (towards adaxial) and spongy parenchyma (towards abaxial).

Presence of air cavity.

## Monocot leaf

Isobilateral, stomata equally distributed on both the surfaces.

Mesophyll- not differentiated into palisade and spongy parenchyma.

Presence of bulliform cells.

## Casparian strips

Made up of suberin and present on the radial and tangential walls of endodermal cells of roots.

## Pericycle

Parenchymatous.

Initiation of lateral roots and vascular cambium during secondary growth.

Spring wood

Early wood, lighter, lower density and have vessels with wider cavities

Autumn wood

Late wood, darker, more dense and have vessels with narrow cavities

Lenticles

Lens shaped openings in the stem of woody trees.

Help in gaseous exchange.