



- Chapter #35~ *Plant Structure and Growth*

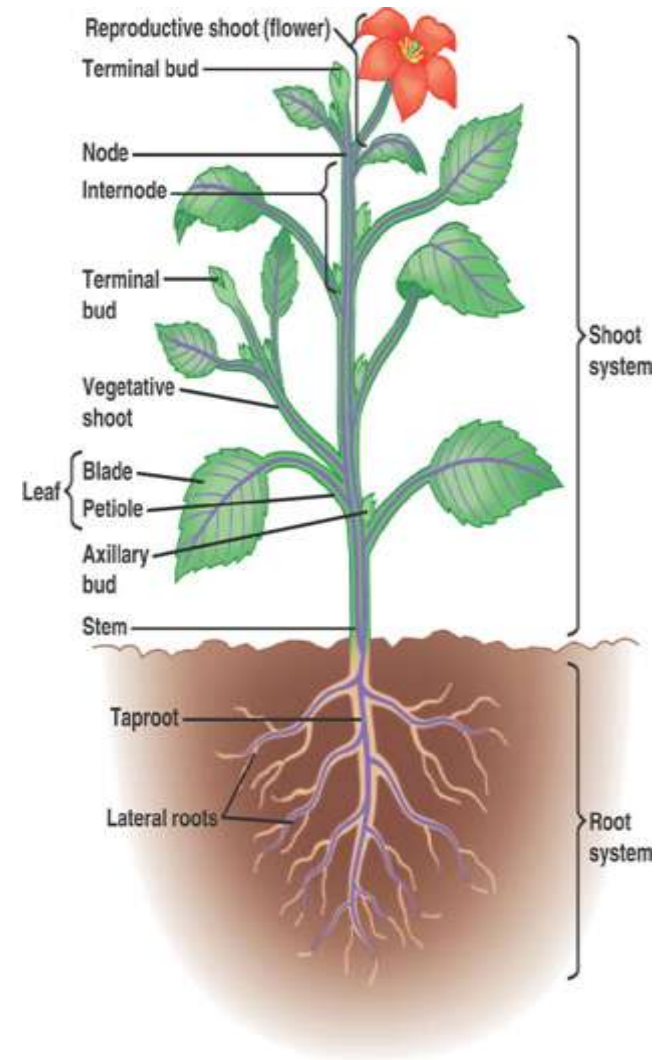
What part of a plant is represented by each of these:



- Carrot
- Celery
- Red Pepper
- Tomato
- Lettuce
- Garbanzo Bean

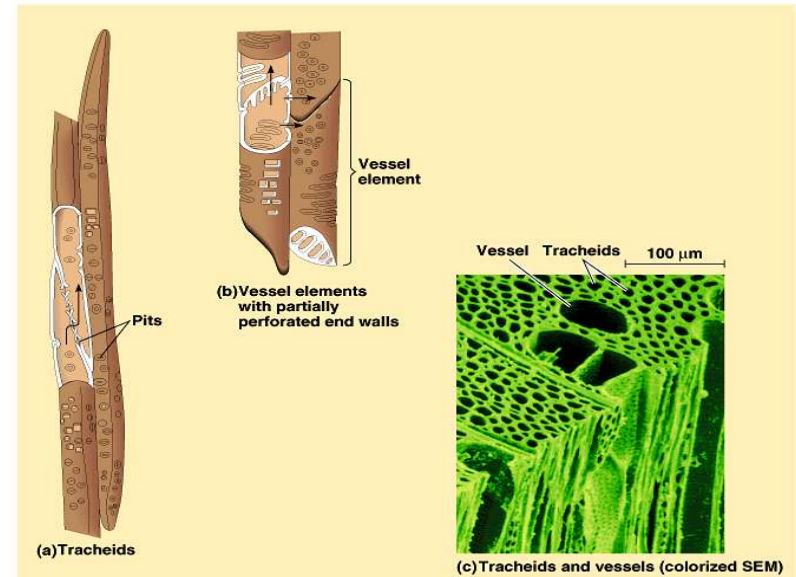
# Angiosperm structure

- **Three basic organs:**
- **Roots (root system)**
  - fibrous: mat of thin roots
  - taproot: one large, vertical root
- **Stems (shoot system)**
  - nodes: leaf attachment
  - internodes: stem segments
  - axillary bud: dormant, vegetative potential
  - terminal bud: apex of young shoot
  - apical dominance: inhibits axillary buds
- **Leaves (shoot system)**
  - blade
  - petiole

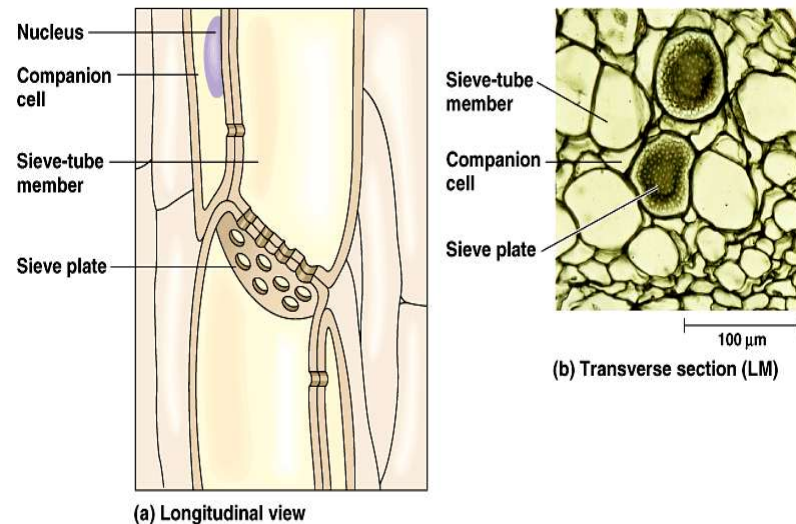


# Plant Organ Systems

- Dermal
- epidermis: single layer of cells for protection
- Periderm: bark
- cuticle
- Vascular (material transport)
- xylem: water and dissolved minerals roots to shoots
- tracheids & vessel elements: xylem elongated cells dead at maturity
- phloem: food from leaves to roots and fruits
- sieve-tube members: phloem tubes alive at maturity capped by sieve plates; companion cells (nonconducting) connected by plasmodesmata
- Ground (photosynthesis, storage, support): pith and cortex



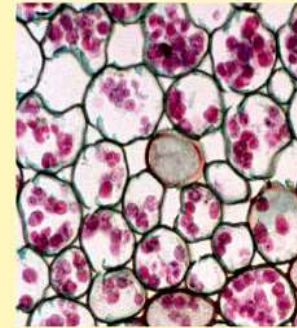
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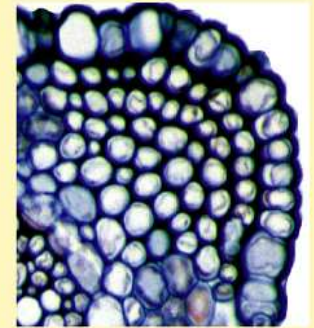
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# Plant Tissue Cell Types

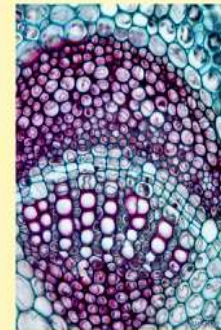
- Parenchyma primary walls thin and flexible; no secondary walls; large central vacuole; most metabolic functions of plant (chloroplasts)
- Collenchyma unevenly thick primary walls used for plant support (no secondary walls ; no lignin)
- Sclerenchyma support element strengthened by secondary cell walls with lignin (may be dead; xylem cells); fibers and sclereids for support



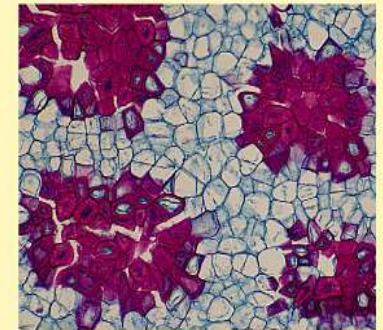
(a) Parenchyma cells



(b) Collenchyma cells



(c) Sclerenchyma cells:  
Fiber cells



Sclerenchyma cells: Sclereids 50 μm

# Plant Growth

- **Life Cycles**

- *annuals*: 1 year (wildflowers; food crops)

- *biennials*: 2 years (beets; carrots)

- *perennials*: many years (trees; shrubs)

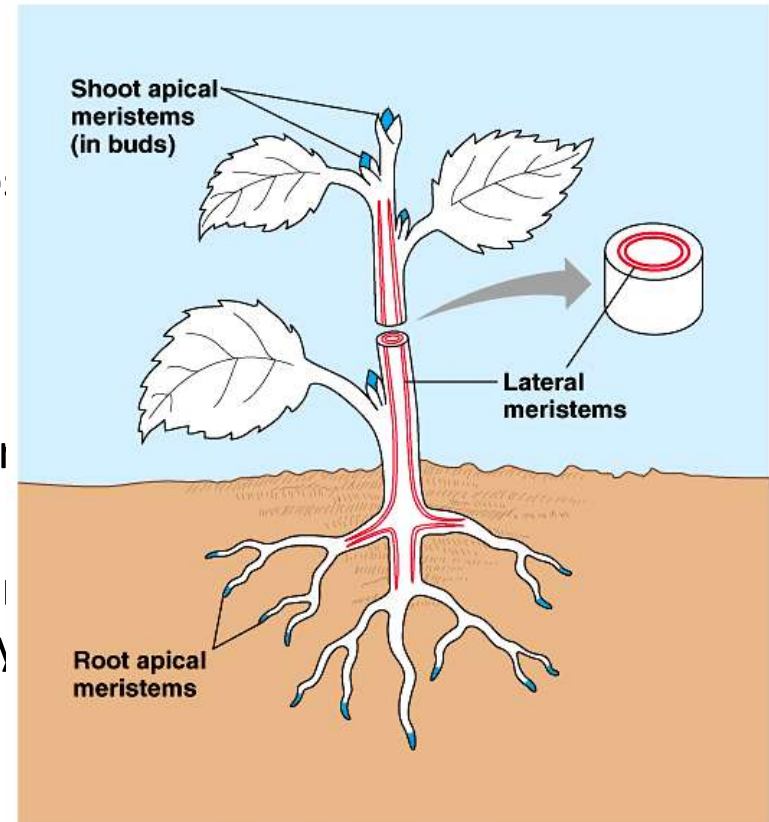
- Deciduous

- Evergreen

- **Meristems**

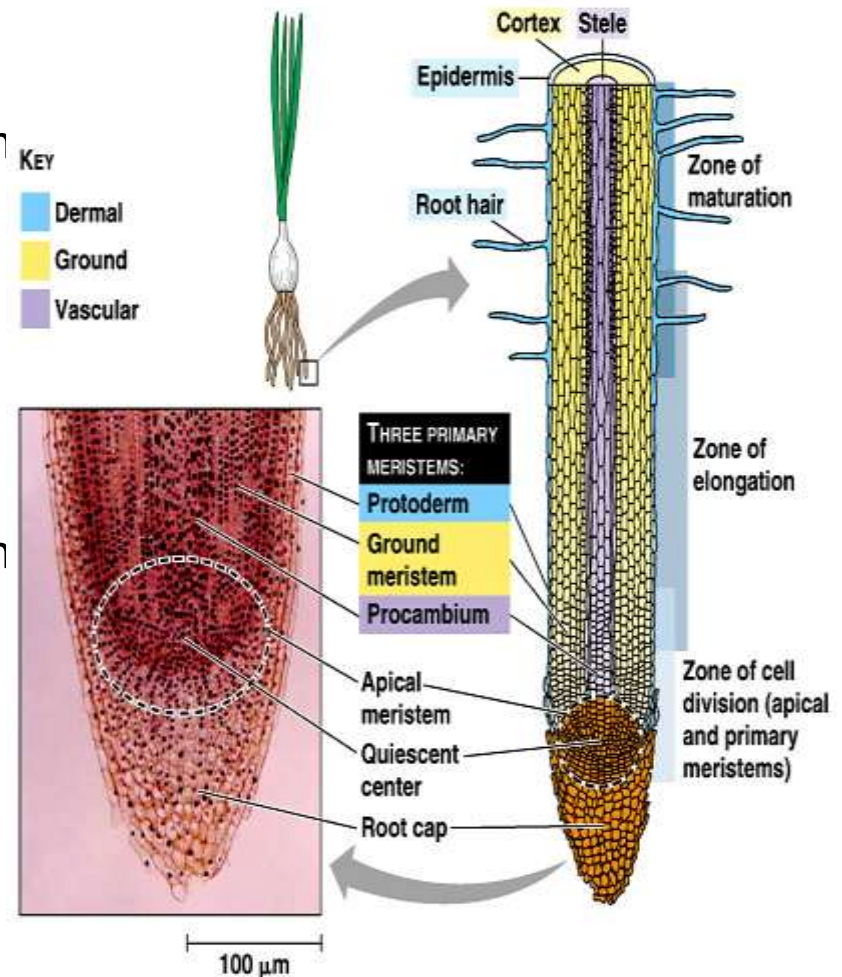
- *apical*: tips of roots and buds; primary growth

- *lateral*: cylinders of dividing cells along length of roots and stems; secondary growth (wood)



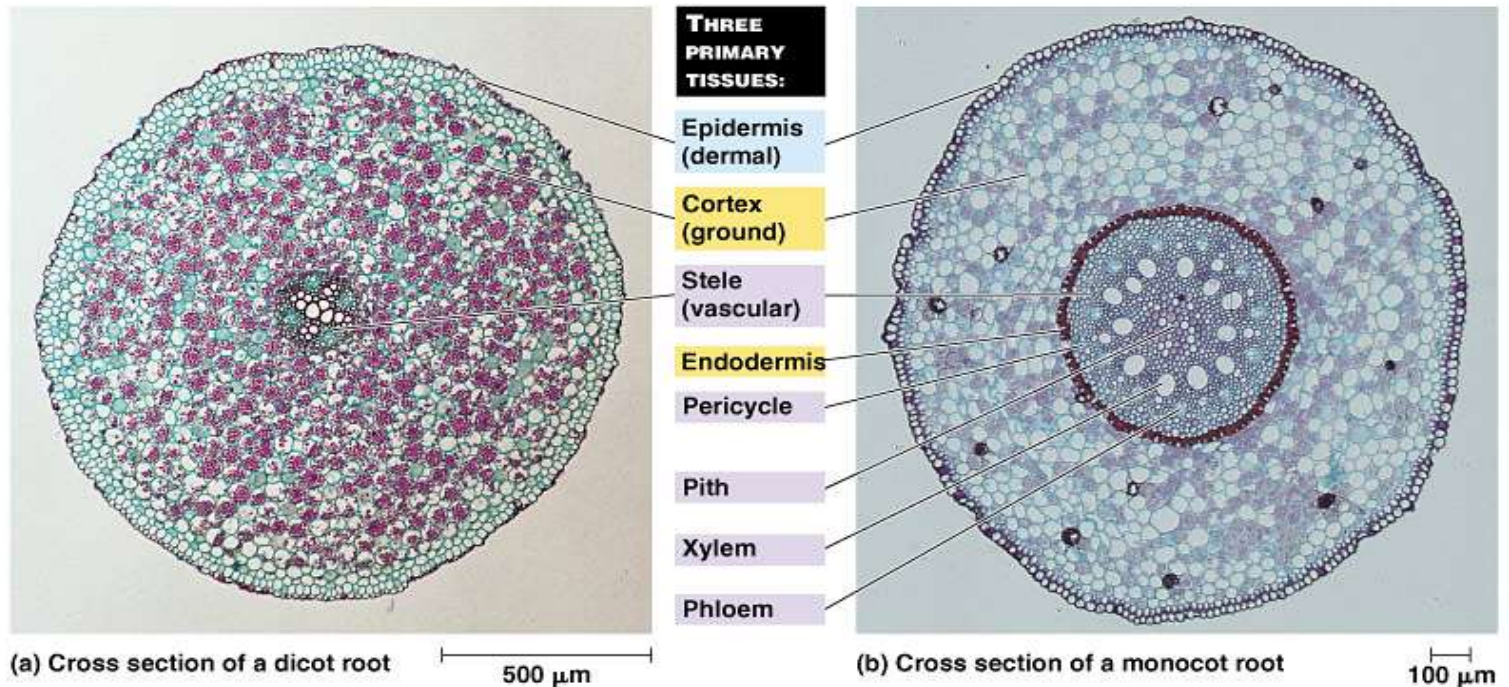
# Primary growth

- **Roots**
- *root cap* ~ protection of meristem
- *zone of cell division* ~ primary (apical) meristem
- *zone of elongation* ~ cells elongate; pushes root tip
- *zone of maturation* ~ differentiation of cells (formation of 3 tissue systems)



# Primary Tissues of Roots

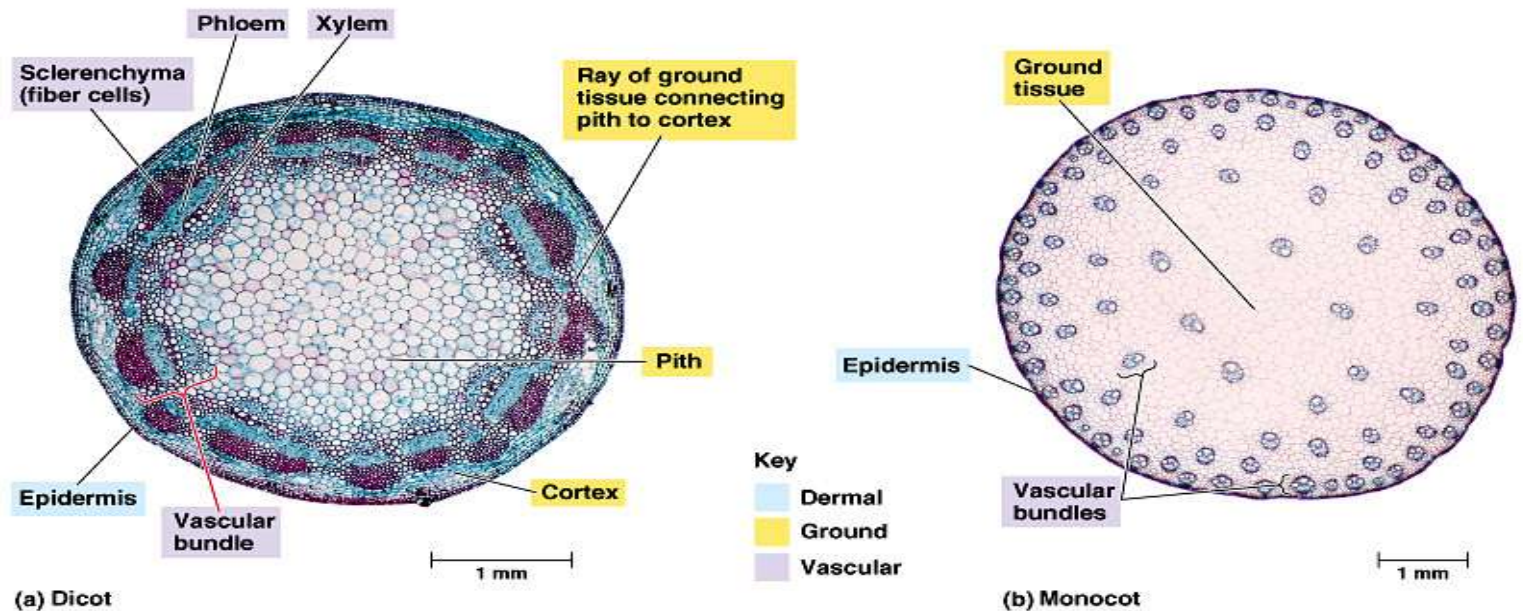
- *Stele*~ the vascular bundle where both xylem and phloem develop
- *Pith*~ central core of stele in monocot; parenchyma cells
- *Cortex*~ region of the root between the stele and epidermis (innermost layer: *endodermis*)
- *Lateral roots*~ arise from *pericycle* (outermost layer of stele); just inside endodermis, cells that may become meristematic





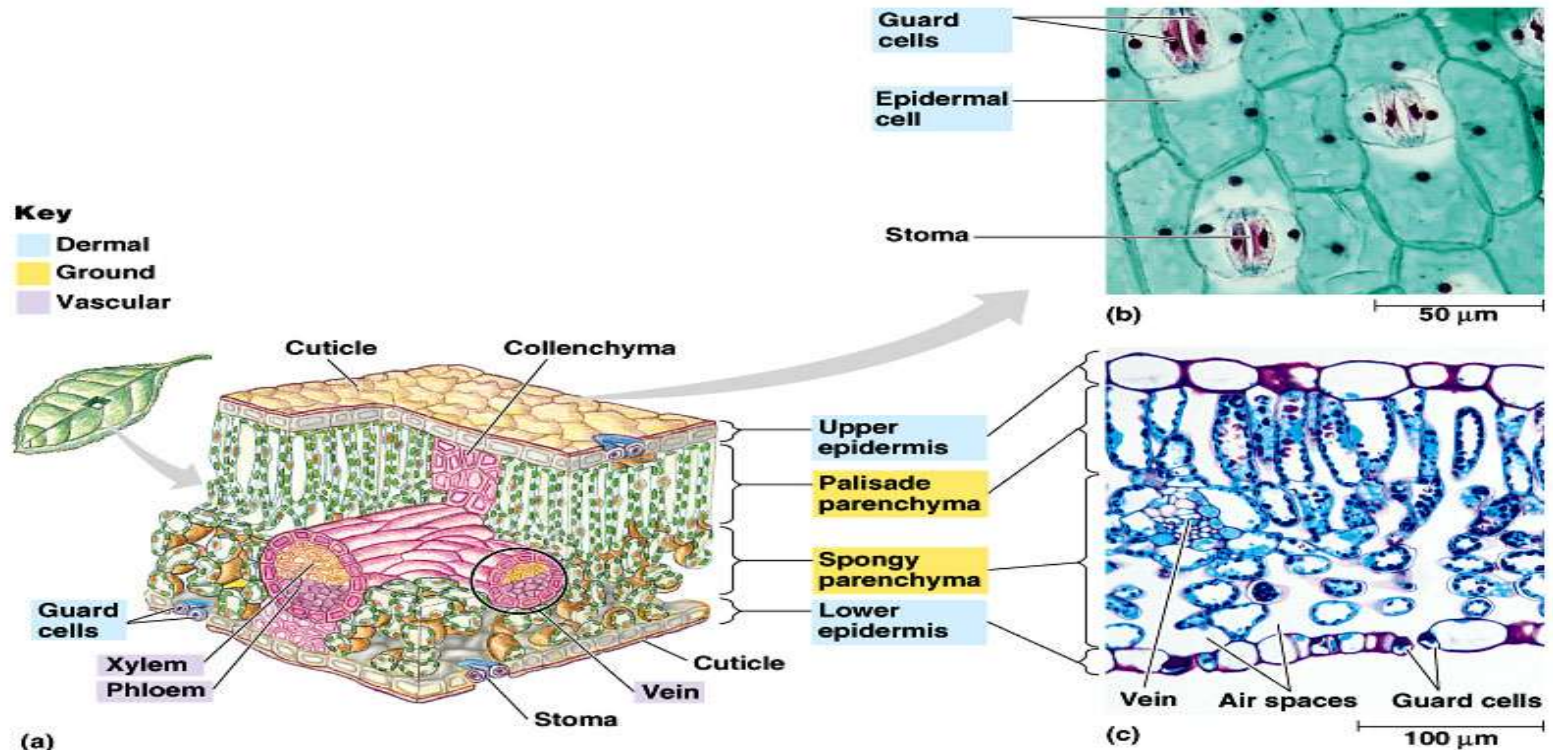
# Primary Tissues of Stems

- Vascular bundles (xylem and phloem)
- Surrounded by ground tissue (xylem faces pith and phloem faces cortex)
- Mostly parenchyma; some collenchyma and sclerenchyma for support



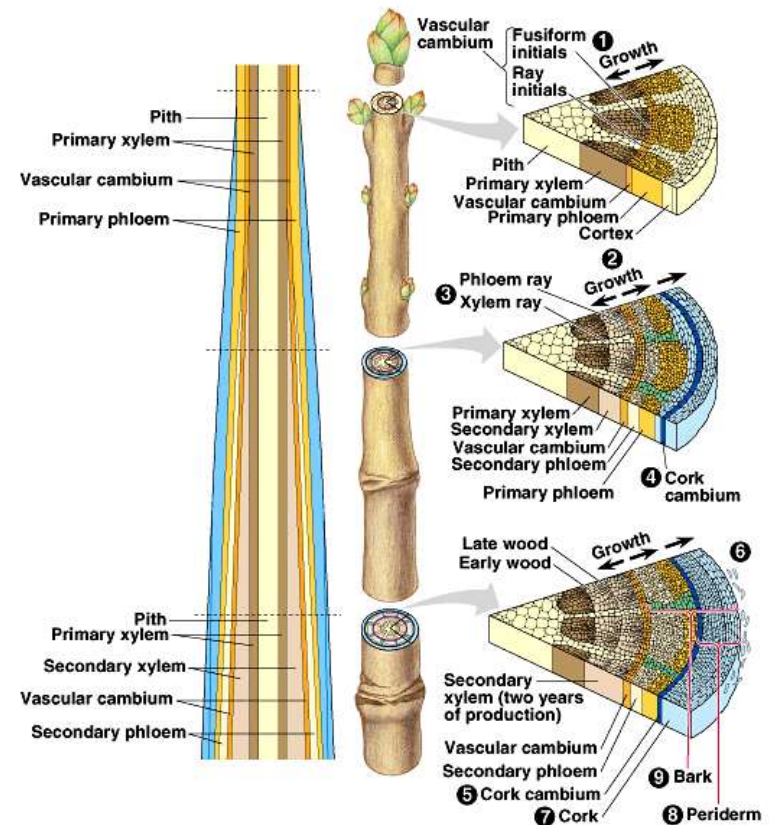
# Primary Tissues of Leaves

- Epidermis/cuticle (protection; desiccation)
- *Stomata* (tiny pores for gas exchange and transpiration)/*guard cells*
- *Mesophyll*: ground tissue between upper and lower epidermis (parenchyma with chloroplasts); palisade (most photosynthesis) and spongy (gas circulation)

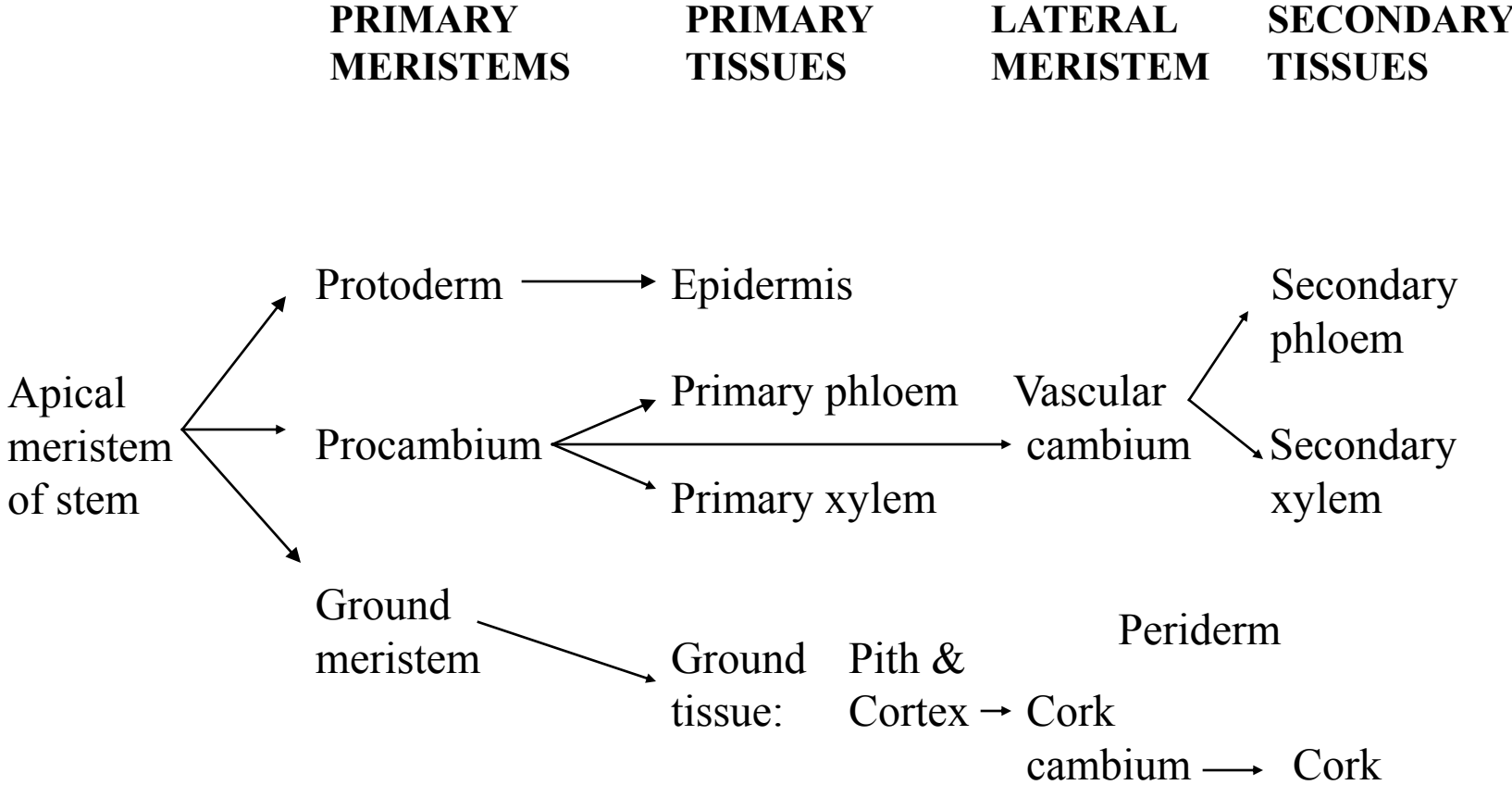


# Secondary Growth

- Two lateral meristems
- *vascular cambium* ~ produces secondary xylem (wood) and secondary phloem (diameter increase; annual growth rings)
- *cork cambium* ~ produces thick covering that replaces the epidermis; produces cork cells; cork plus cork cambium make up the *periderm*; *lenticels* (split regions of periderm) allow for gas exchange; *bark* ~ all tissues external to vascular cambium (phloem plus periderm)



Summary of primary & secondary growth in a woody stem



# Today's Lab: Structure and Function in Plants

You will be observing the three main organs of plants

root

shoot

leaf

For each organ, you will need to make a sketch of each of the following levels of organization:

organ

tissue

cell

Each sketch will show labeled structures and include a description of the function of each part



*Plant Structure and Growth*

# Plant Tissue Foldable

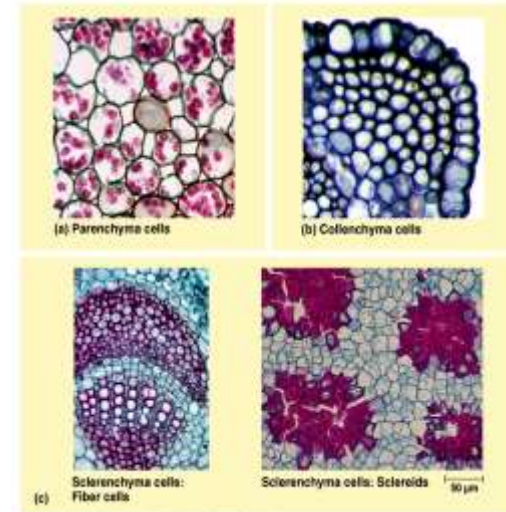
- Three cell types

- Parenchyma
- Collenchyma
- Sclerenchyma

- Fold paper in half (hot dog)
- Divide it into thirds
- Front Cover
  - Picture with labels
- Inside top
  - Examples of where cell type is found
- Inside bottom
  - Description of structure
  - Description of function

# Plant Tissue Cell Types

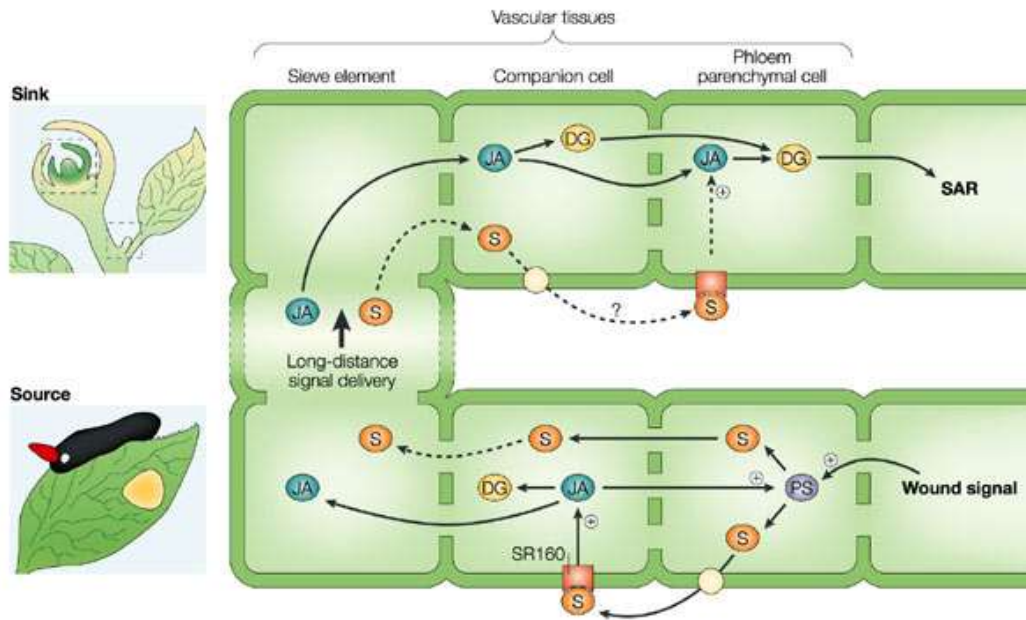
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# Cell Junctions

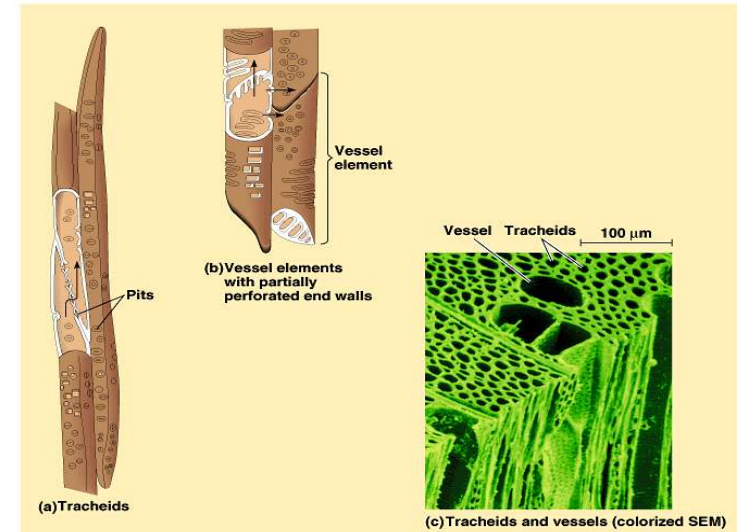


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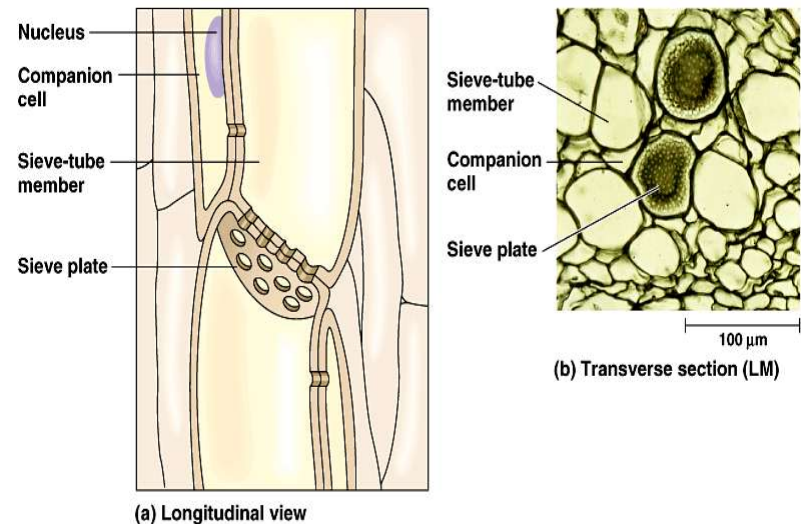
- Gap Junction
- Desmosome
- Tight junction
- Adheren
- Plasmodesmata

# Plant Tissues

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# Angiosperm structure

## ◎ Three basic organs:

### ◎ Roots (root system)

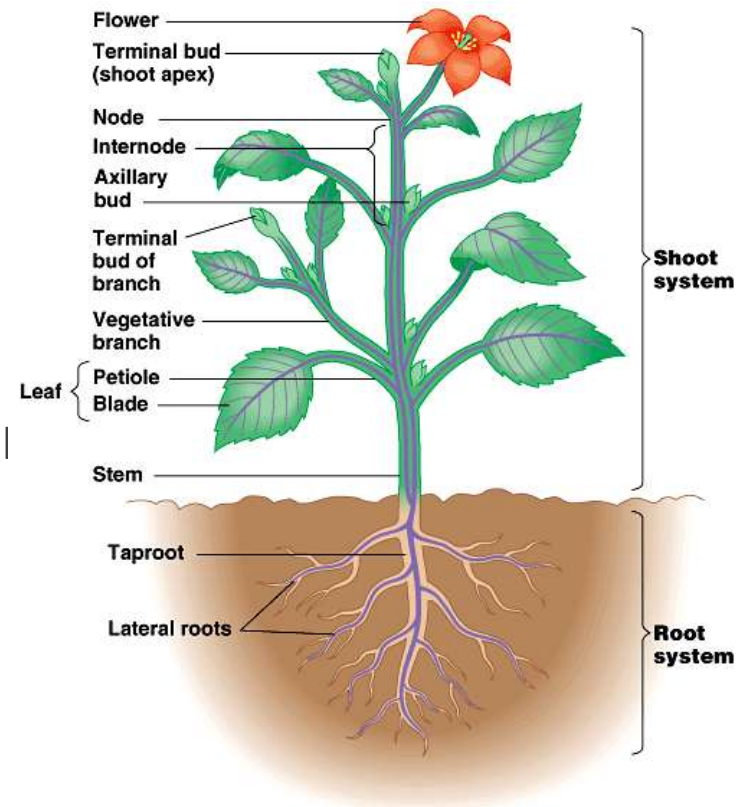
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# Plant Growth

## ☉ Life Cycles

☉ *annuals*: 1 year (wildflowers; food crops)

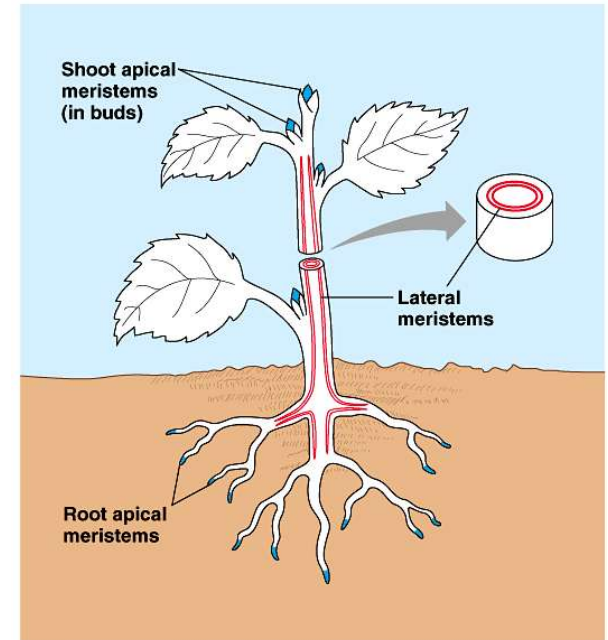
☉ *biennials*: 2 years (beets; carrots)

☉ *perennials*: many years (trees; shrubs)

## ☉ Meristems

☉ *apical*: tips of roots and buds; primary growth

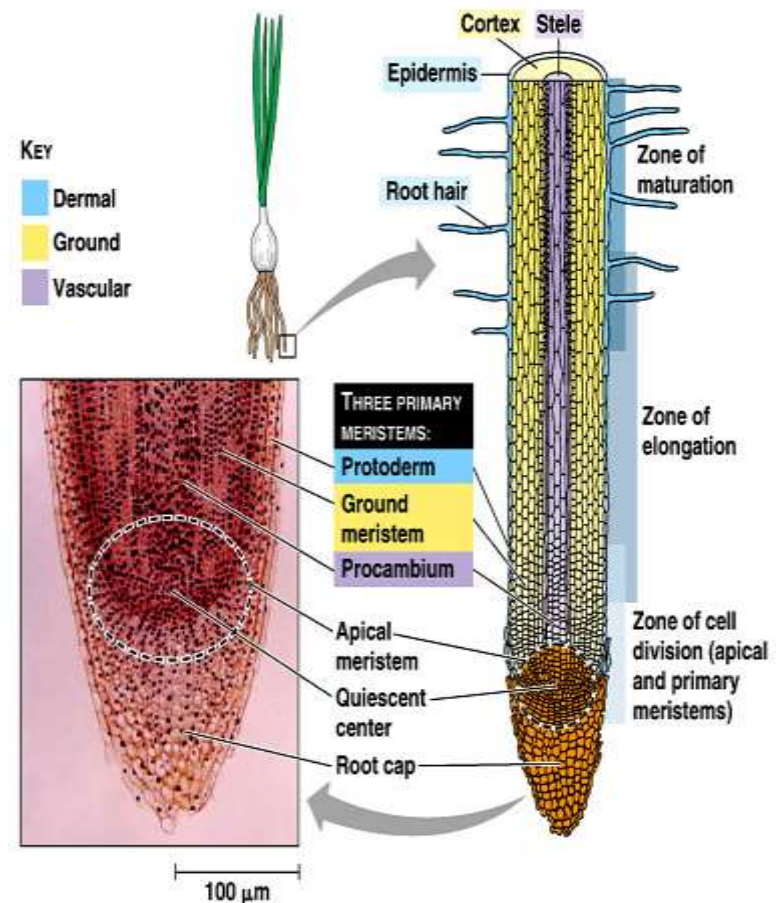
☉ *lateral*: cylinders of dividing cells along length of roots and stems; secondary growth (wood)



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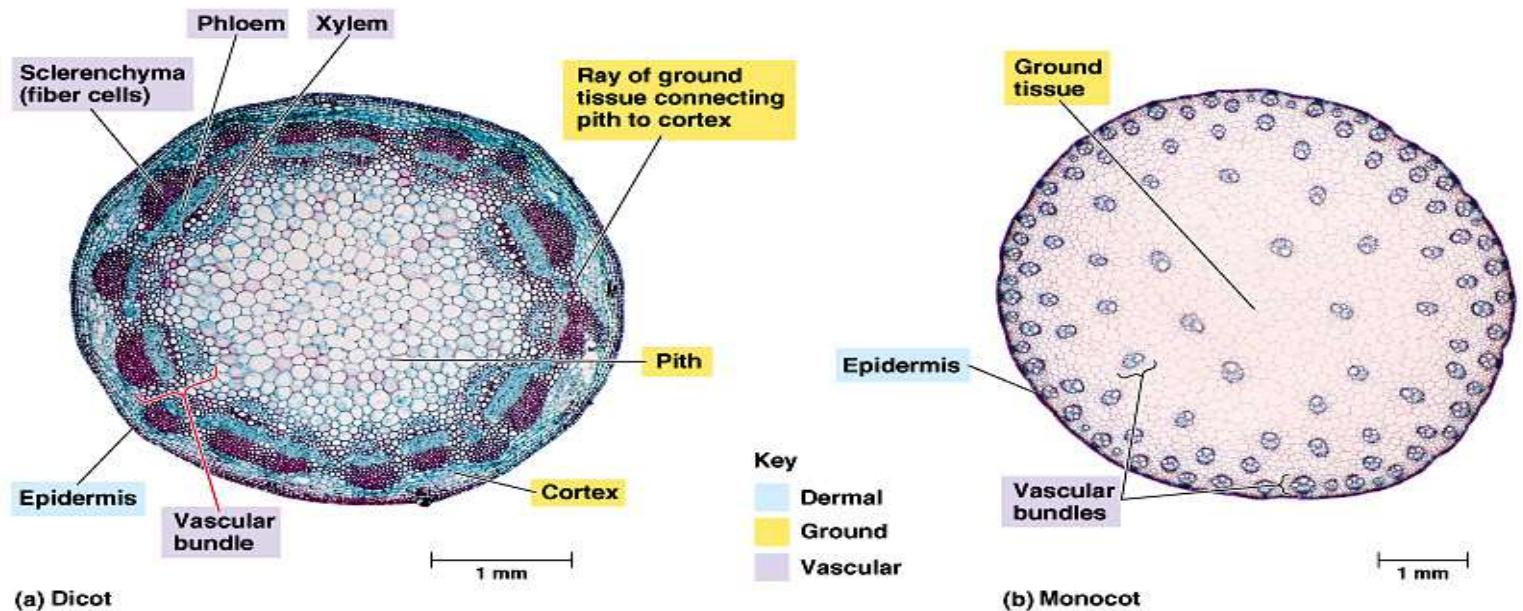


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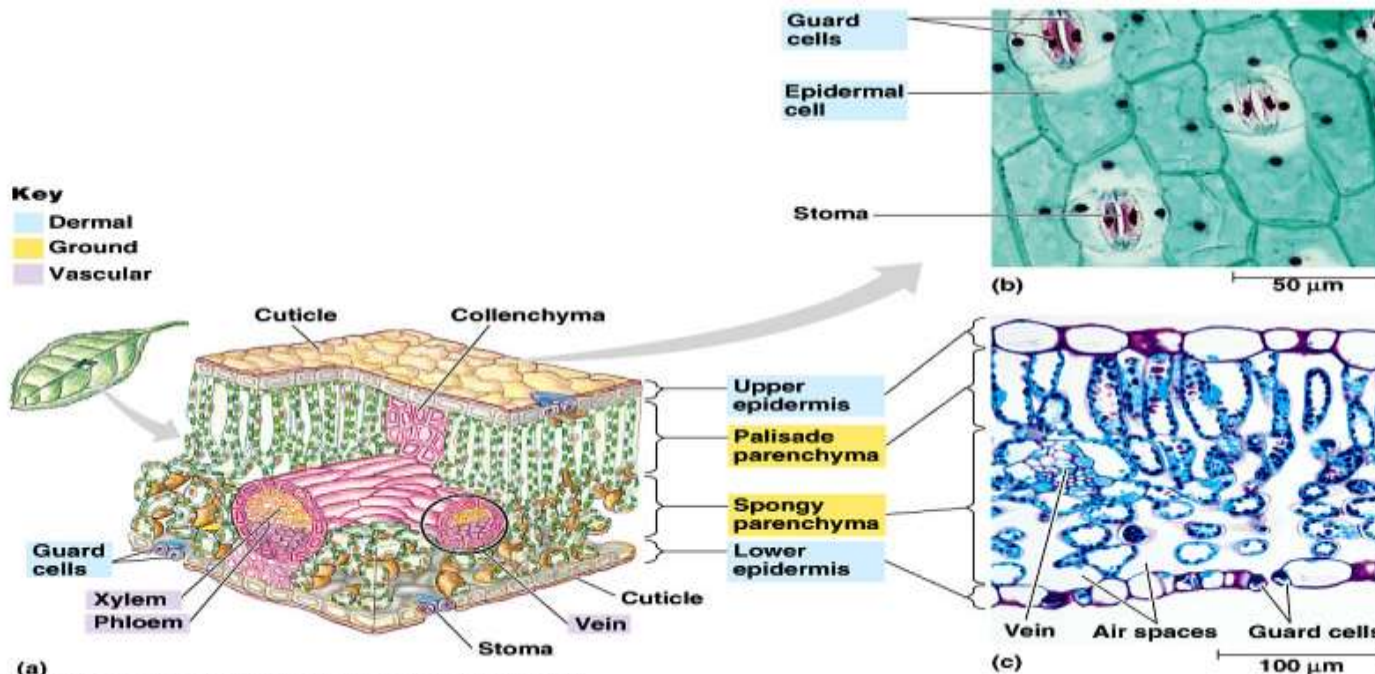
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# Primary Tissues of Leaves

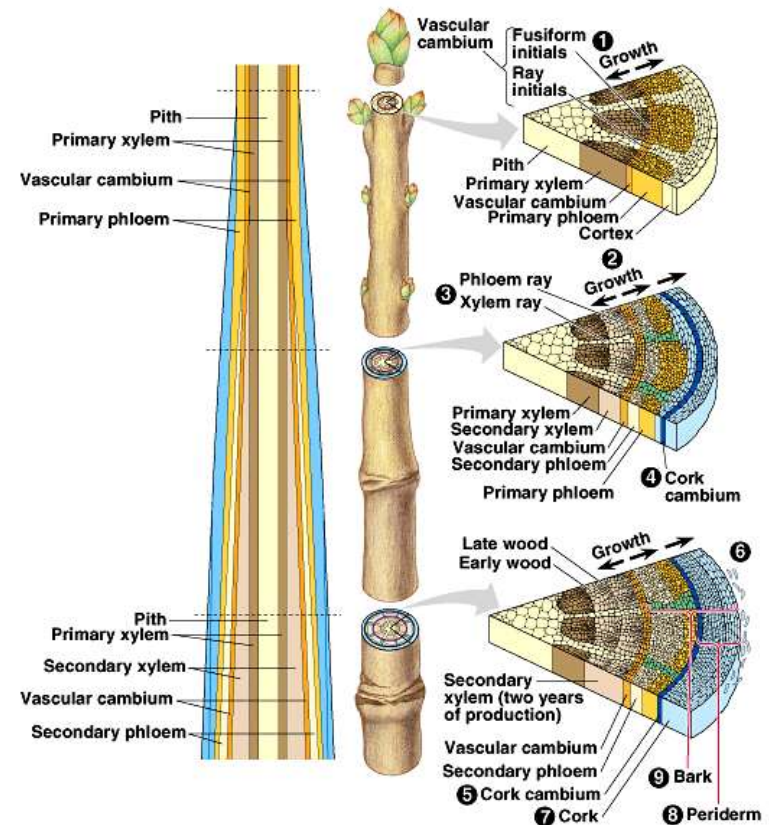
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