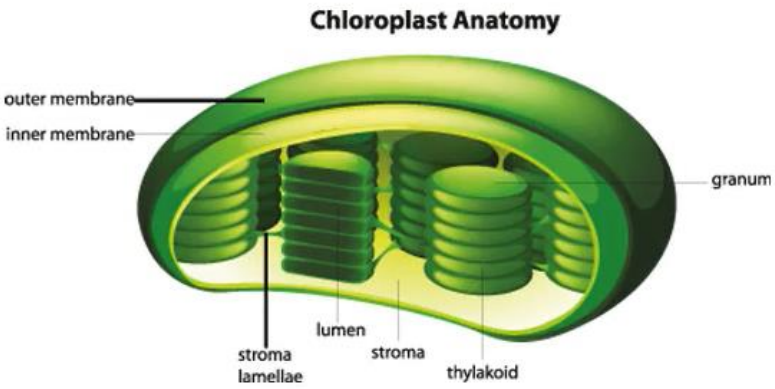
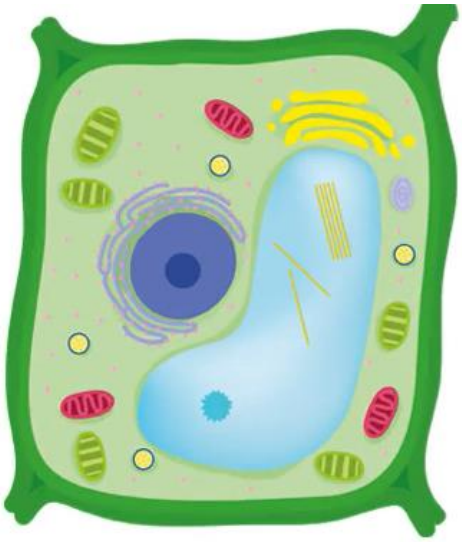
CONCEPT: ROOTS AND SHOOTS

- Plants are eukaryotic organisms that synthesize sugars using sunlight energy in a process called photosynthesis
    - □ ***Chloroplast*** – endosymbiotic organelles in which photosynthesis occurs, appear green from chlorophyll
    - □ ***Vacuole*** – vesicle filled with water, in plants this solution of water, sugar, amino acids, etc. is called cell sap

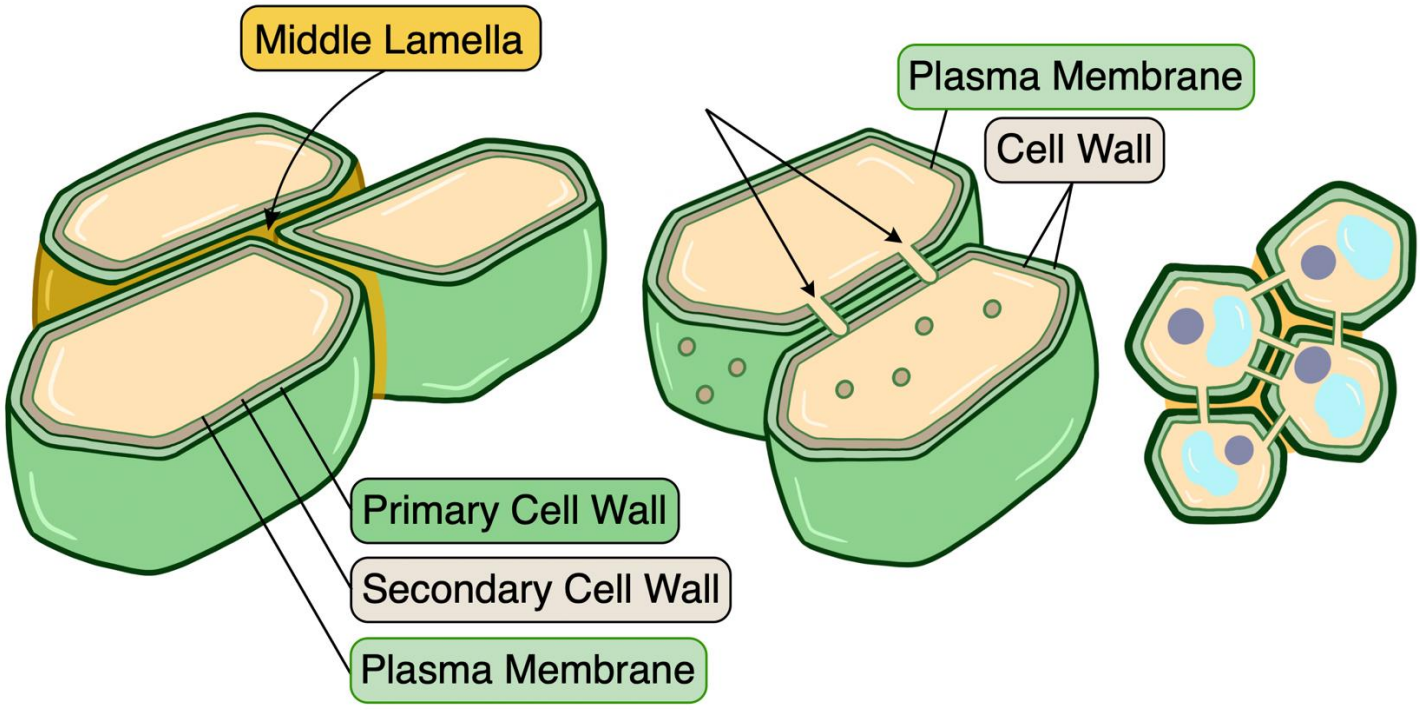
EXAMPLE:





- ***Cell wall*** – rigid structure that provides support and protection
    - □ ***Primary cell wall*** – flexible structure of cellulose that surrounds the plasma membrane while cell is growing
    - □ ***Secondary cell wall*** – thick structure made of cellulose, and lignin in vascular cells, formed after cell has grown
        - ***Lignin*** – polymer found in vascular plants that helps cells maintain rigidity, important component of wood
- ***Plasmodesmata*** – channels between plant cells for transport of materials between cells and cell signaling

EXAMPLE:



CONCEPT: ROOTS AND SHOOTS

- Plants require H_2O (source of electrons), CO_2 (source of carbon), and sunlight (energy input) for photosynthesis
- Plants require N, P, K, Mg to build molecules and maintain their cells, these are usually obtained as ions in soil
    - □ SA:V ratio → leaves (sheets) > roots (tubes) > storage structures (not involved in absorption)

EXAMPLE:

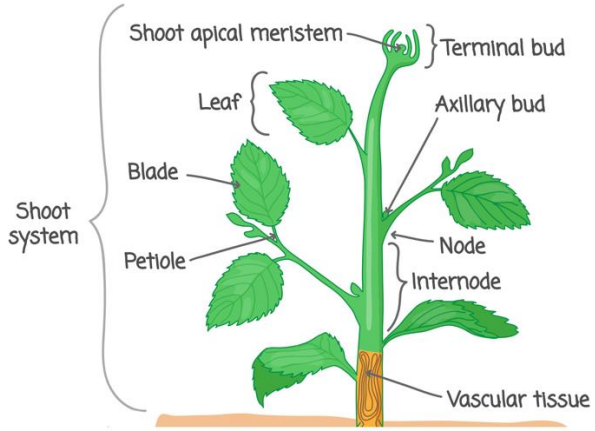
- ***Root system*** – anchors plant, absorbs water and ions from soil, stores materials produced in the shoots for later use
    - □ ***Taproot*** – largest, dominant root of the plant, from which other roots project
        - ***Lateral root*** – extends horizontally
    - □ ***Adventitious*** – roost develop from shoot system rather than root system

EXAMPLE:

CONCEPT: ROOTS AND SHOOTS

- ***Shoot system*** – gathers CO_2 and light, and carries out photosynthesis
  - □ ***Stem*** – vertical growth structure of vascular plants
    - ***Node*** – part of stem where leaves and buds grow
    - ***Internode*** – part of stem between nodes
    - ***Lateral*** (***auxiliary***) ***bud*** – embryonic shoot at base of leaf that develops into stem, branch, or flower
    - ***Apical bud*** – primary growth point located at the top of the plant
  - □ ***Branch*** – woody structural projection of a plant

EXAMPLE:

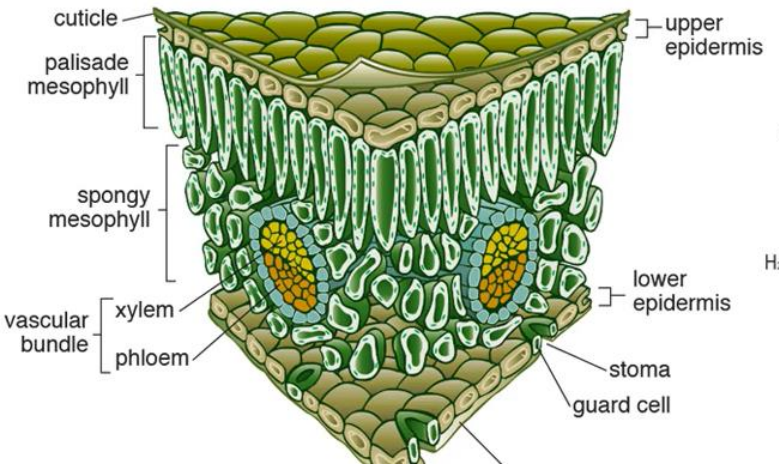


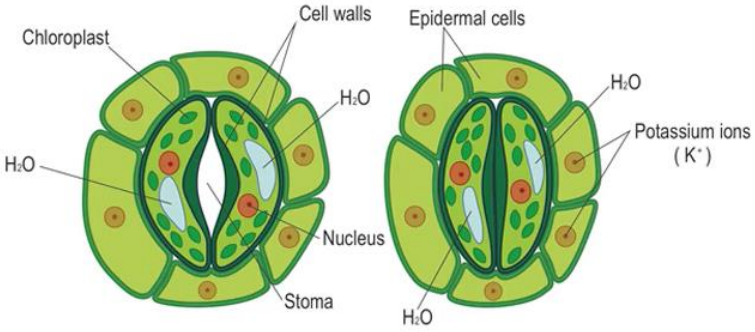
Axillary

Terminal

- ***Leaf*** – organ of vascular plants attached to the stem, generally the site of photosynthesis and gas exchange
  - □ ***Petiole*** – stalk connecting the leaf to the stem
  - □ ***Blade*** – portion of the leaf attached to the petiole
  - □ ***Mesophyll*** – interior tissue of the leaf
  - □ ***Stomata*** – pores that control gas exchange, and help regulate water loss
    - ***Guard cell*** – specialized cell that use turgidity to open and close the pore

EXAMPLE:





CONCEPT: ROOTS AND SHOOTS

- ***Phenotypic plasticity*** – change in form based on environment

□ Roots:

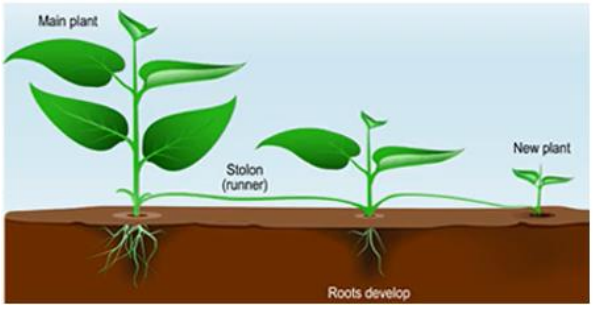
- Prop roots – adventitious roots modified for aerial support
- Pneumatophores – generally adventitious, allow gas exchange between roots and atmosphere

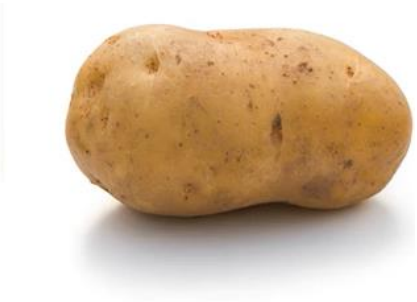
EXAMPLE:

□ Stems

- Cacti – water storage
- Stolons – produce new individuals above ground
- Rhizomes – produce new individuals underground
- Stem tubers – store carbohydrate
- Thorns – defensive structures

EXAMPLE:





□ Leaves:

- Onions (bulbs) – food storage
- Succulents – water storage
- Tendrils – allow climbing plants to grip
- Floral mimics (poinsettia) – insect pollination
- Traps – eating animals
- Cactus spines – defensive structures

EXAMPLE: