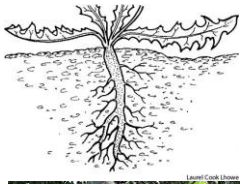
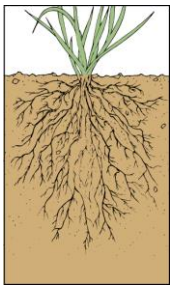
Plants, Photosynthesis and Respiration

Plants

1. **Shoot system** - is above ground and includes the organs such as leaves, buds, stems, flowers (if the plant has any), and fruits (if the plant has any)



2. **Root system** - includes those parts of the plant below ground, such as the roots, tubers, and rhizomes

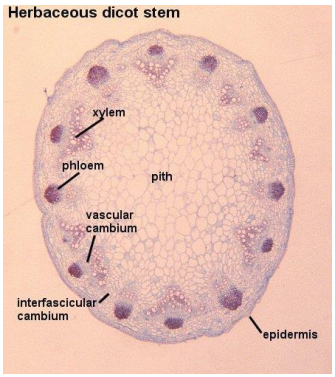


Types of roots

- Taproot - main root of a primary-root system. It grows vertically downward, found in dicot plants
- Fibrous root - root structures characterized by numerous equally sized roots extending in a complex network from the base of the plant, found on monocot plants
- Adventitious root - root that grows from somewhere other than the primary root, for example, roots that arise from stems or leaves

PlantTissues

1. **Dermal tissue** covers the outer surface, in non woody plants the outer layer is the epidermis; a waxy layer covers the epidermis it is called the cuticle; dermal tissue on woody stems and roots consists of several layers of dead cells that are referred to as cork
2. **Ground tissue** makes up the bulk of the primary plant body; parenchyma, collenchyma, and sclerenchyma cells are common in the ground tissue; functions of ground tissue depend on where it is – in leaves it is photosynthesis, in stems and roots it is storage, also in stems it is used to support vascular tissue (3rd type of plant tissue)



-Meristem - undifferentiated plant tissue from which new cells are formed, as that at the tip of a stem or root

-Apical meristem - meristem at the tip of a plant shoot or root that causes the shoot or root to increase in length

-Cortex - ground tissue surrounding the vascular tissue

-Pith – ground tissue inside the ring of vascular tissue

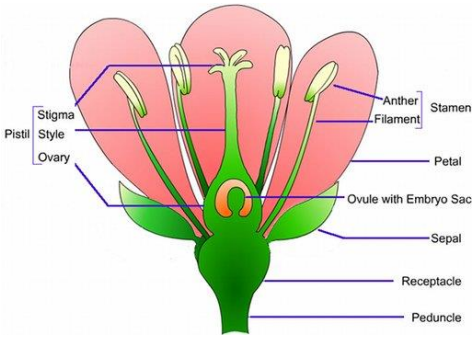
-Stomata - pore found on plant leaves and stems; tiny structures allow the plant to take in and release gases and achieve photosynthesis

-Mesophyll - material that makes up the majority of a plant's leaf, found inside the leaves epidermis

3. **Vascular tissue** - set of cells stacked into tubes that move materials through the plants body
   a) Xylem – set of tubes that move water through plants body
   b) Phloem – set of tubes that move food (sugar) through plants body

Plant Reproduction

- Pollination - transfer of pollen from a stamen to a pistil; fertilization in flowering plants. Pollination can happen with animals, wind and water.



Flower parts

- Stamen - pollen-producing reproductive organ of a flower, usually consisting of a filament and an anther, male
- Anther - pollen-bearing part (sac) of the stamen, male
- Pistil- female, ovule-bearing organ of a flower, including the stigma, style, and ovary
- Seed - small embryonic plant enclosed in a covering called the seed coat, usually with some stored food)
- Endosperm - nutritive tissue (food) within seeds of flowering plants

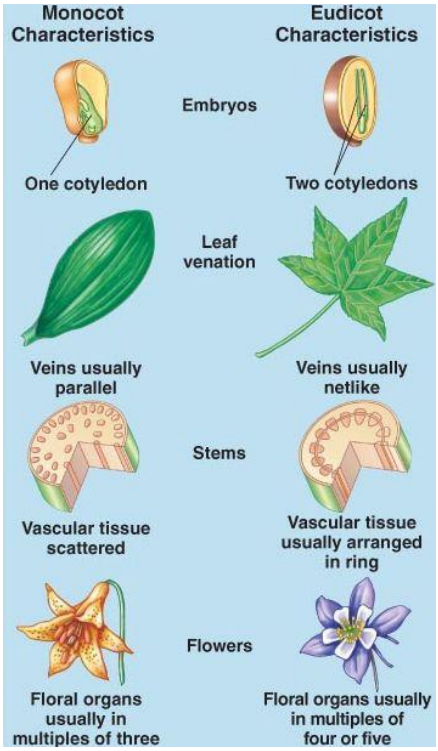
- Seed germination - process by which the plant embryo within the seed resumes growth after a period of dormancy and the seedling emerges

Types of plants that have seeds

1) Gymnosperms - seed plants whose seeds do not develop within a sealed container (a fruit)
2) Angiosperms - produce seeds that develop enclosed within a specialized structure called a fruit

a) Monocot - flowering plants that produce seeds with one seed leaf (cotyledon); produce flowers with parts that are in multiples of three and have long, narrow leaves with parallel veins

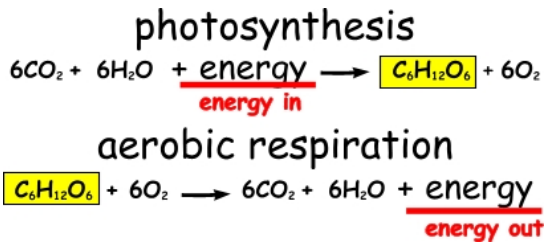
b) Dicot - flowering plants that produce seeds with two seed leaves; produce flowers with parts in multiples of fours,or five and have leaves with branching veins



Terms to know

- Transpiration - is the loss of water vapor from parts of plants (similar to sweating), especially in leaves (through openings called stomata) but also in stems, flowers and roots
- Legumes - members of the pea family, produce protein-rich seeds in long pods; many legumes have nitrogen-fixing bacteria, which add nitrogen compounds to the soil, in its roots

Photosynthesis and Respiration



CELLULAR RESPIRATION	PHOTOSYNTHESIS
Food Broken Down	Food Synthesized
Energy from Glucose Released	Energy from Sun stored in Glucose
Reactants glucose and oxygen	Reactants water, carbon dioxide, and energy
Carbon Dioxide given off	Oxygen given off
Oxygen taken in	Carbon dioxide taken in
Produces Carbon Dioxide and Water	Produces Sugars (Glucose)
Does not require Light	Requires Light
Occurs in ALL Living Cells	Occurs only in presence of Chlorophyll
Organisms often called Heterotrophs	Organisms called Autotrophs

Reactants – material to left of arrow

Products – what is made in the chemical reaction, they are to the right of the arrow

Photosynthesis

- the synthesis of complex organic materials, especially carbohydrates, from carbon dioxide, water, and inorganic salts, using sunlight as the source of energy and with the aid of chlorophyll and associated pigments
- $6CO_2 + 6H_2O$ -----→ $C_6H_{12}O_6 + 6O_2$

Cellular Respiration

- process of cell metabolism in which cells turn food (glucose) into usable energy in the form of ATP; glucose is broken down in the presence of molecular oxygen.
- $C_6H_{12}O_6 + 6O_2$ ----------→ $6CO_2 + 6H_2O$ + energy (ATP)

Aerobic respiration occurs in the presence of oxygen and yields the majority of energy for organisms capable of aerobic respiration. There are 3 steps in aerobic respiration: glycolysis, Krebs Cycle, electron transport chain (ETC). **aerob means oxygen**

Respiration without oxygen (anaerobic)

Fermentation – recycling of NAD^+ using an organic hydrogen acceptor; needed so NAD^+ can be recycled

Alcoholic Fermentation – pyruvate + NADH ---→ CO_2, NAD^+, ethanol (alcohol); occurs in single-celled organisms; makes – beer, wine, bread

Lactic Acid Fermentation – pyruvate + NADH -→ NAD^+, Lactate (lactic acid), makes – yogurt, sauerkraut, pickles, kimchi; occurs in animals; lactic acid can make your muscles sore