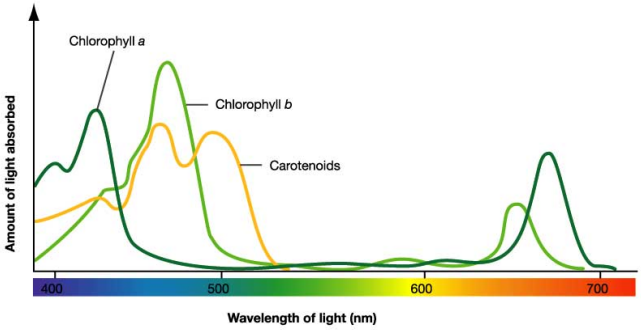
Chlorophyll and Chloroplasts

Pigments: Light- absorbing molecule that gathers the sun's energy

- Plant's principal pigment is chlorophyll
- 2 types of chlorophyll found in plants, chlorophyll a and b, absorb light very well in blue- violet and red regions of visible spectrum. Chlorophyll does not absorb light well in the green region of the spectrum
- Leaves reflect green light, plant looks green
- Plants contain red and orange pigments that absorb light in other regions of the spectrum
- Temperature drops, chlorophyll molecules break down first



Chloroplast

- Contain an abundance of saclike photosynthetic membranes- **thylakoids**- interconnected and arranged in stacks known as grana
- Pigments such as chlorophyll are located in the thylakoid membranes
- Fluid portion of the chloroplast, outside the thylakoids, is the **stroma**

When chlorophyll absorb light, a large fraction of the light energy is transferred to the electrons in the chlorophyll molecule itself. By raising the energy level of these electrons, light energy can produce a steady supply of high- energy electrons, which is what makes photosynthesis work

High- Energy Electrons

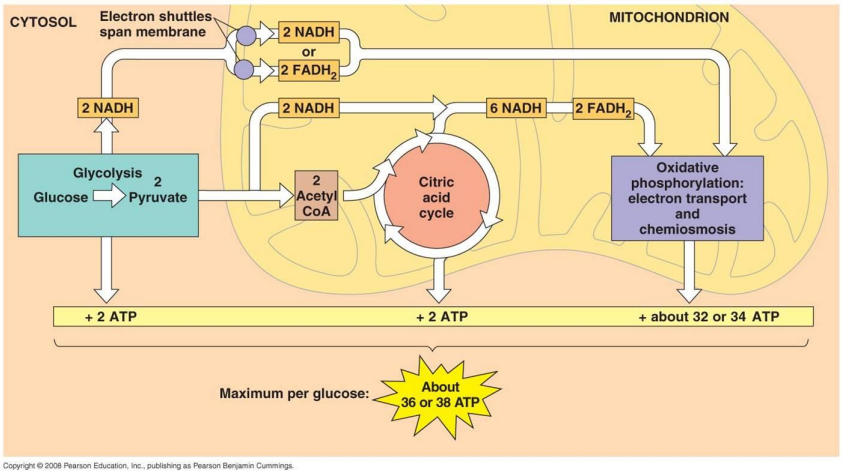
- Electron carriers transport high energy electrons from chlorophyll to other molecules
- An electron carrier is a compound that can accept a pair of high- energy electrons and transfer them, along with most of their energy, to another molecule
- One carrier molecule is NADP+

Reaction of Photosynthesis: $6CO_2 + 6H_2O$ (+ light energy) $\rightarrow$ $C_6H_{12}O_6 + 6O_2$.

Photosynthesis involves two sets of reactions

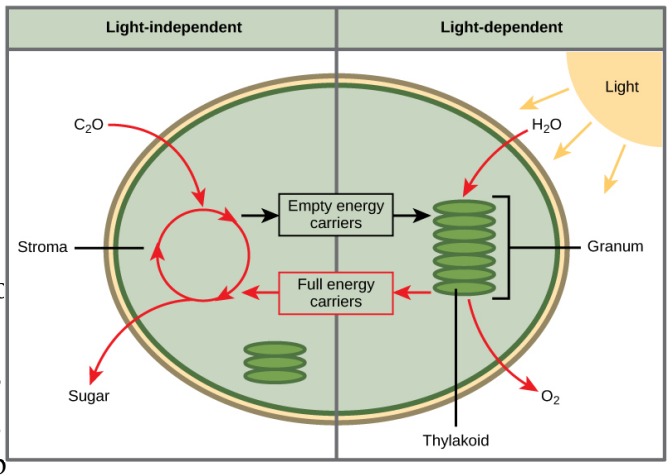
Cellular Respiration

Stage	Location	Amount of ATP	Oxygen Required
1.Glycolysis sugar splitting 2.Krebs Cycle 3.ETC	1.Cytoplasm 2.Mitochondria 3.Mitochondria	1.4 ATP 2.2 ATP 3.32 ATP/9 ATP	1. No 2.Yes 3.Yes



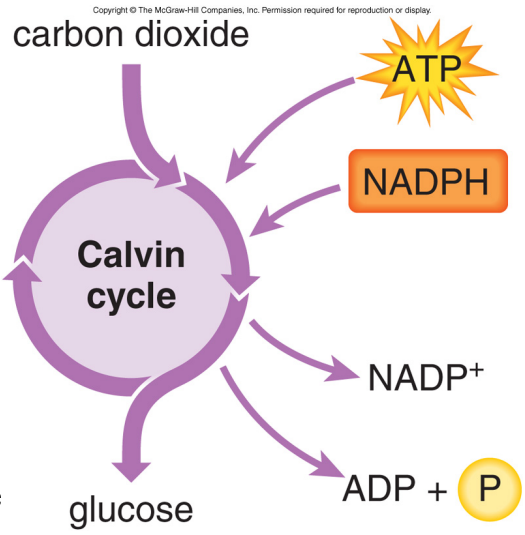
Fluid portion of chloroplast, outside the thylakoids, is the stroma

Light Dependent Reactions: Generating ATP and NADPH



- Light- dependent reactions use energy from sunlight to produce oxygen and convert ADP and NADP+ into energy carriers ATP and NADPH
- Light dependent reactions occur in thylakoids of chloroplasts
- Thylakoids,saclike membranes, containing most c machinery needed to carry out reactions. Contain clusters of chlorophyll and proteins,photosystems
- Photosystems surrounded by accessory pigments, essential to the light- dependent reactions. Absorb sunlight and generate high- energy electrons that are passed to a series of electron carriers embedded in the thylakoid membrane

Light Independent Reactions: Producing Sugar



- ATP and NADPH formed by light- dependent contain an abundance of chemical energy, but are not stable enough to store energy for more than a few minutes
- Light Independent Reaction: Calvin Cycle
- Plants use energy that ATP and NADPH contain to build stable high- energy carbohydrate compounds that can be stored for a long time

Light-independent reactions, ATP and NADPH from light-depende reactions used to produce high-energy sugars

The 2 reactions work together to capture the energy of sunlight and transform it into energy- rich compounds such as CO2

Factors Affecting Photosynthesis : Temperature, light intensity and availability of water.

Light Dependent Reaction

Reactants:H_20 (water), ADP, and $NADP^+$.

Products:Oxygen, ATP, and NADPH.

E.Light Independent Reactions

Reactants-ATP, NADPH, and Carbon Dioxide.

Products: Glucose

Components of a leaf

Cuticle-protects from environmental stresses and prevents water loss (transpiration)

Upper Epidermis- tough and prevents tearing-covered by cuticle

Lower Epidermis-tough and prevents tearing-covered by cuticle

Palisade Mesophyll-absorbs sunlight for photosynthesis

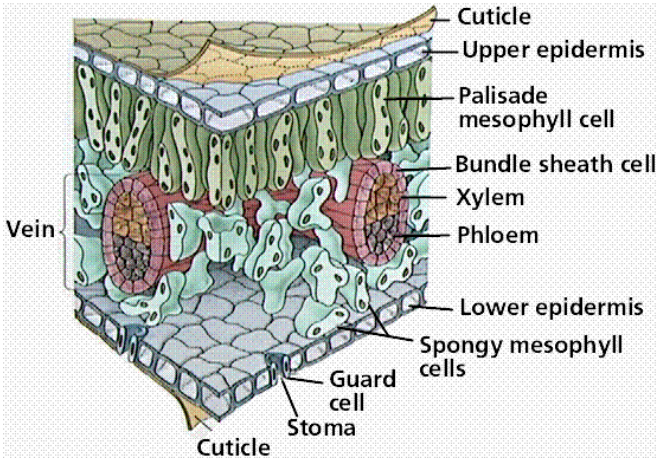
Spongy Mesophyll-allows the exchange of gases (H_2O, CO_2, and O_2)

Stoma-allow carbon dioxide, oxygen, and water to diffuse in and out of the cell

Xylem: Transports water

Phloem: Transports sugars

Bundle Sheath: Surrounds xylem and phloem.



D. Components of a root

Root hairs: Increase surface area to allow more water and minerals to enter

Cortex: Water and minerals pass through the cortex from the epidermis to the center

Endodermis: Waxy and encloses vascular cylinder. Forces water to go through cells and not between.

Vascular cylinder: Xylem and phloem

Root Cap: Protects the root as it expands in the soil.

Types of Roots: Fibrous and taproot

IV. **Transpiration**: Loss of water through leaves. Cools leaves on hot days but can be threatening when water is scarce. Regulated by stomata

V. Tendencies and Hormones

Phototropism: Tendency of a plant to grow toward a light source

Gravitropism: Response of a plant to gravity-stem grows upright and roots grow down.

Auxins: stimulate cell elongation and the growth of new roots.

Gibberellins: stimulate growth and may cause dramatic increases in size (stems and fruit)

Cytokinins: Stimulate cell division, help balance root and shoot growth, regenerate damaged tissues, and delay the aging of leaves

Phototropism:Growth response of plant stems to light:plants demonstrate phototropism

- Some raw materials are needed to make enzymes, the lipids in cell membranes and DNA
- Nutrients that the body needs: water,carbohydrates,fats,proteins,vitamins and minerals