

Photosynthesis

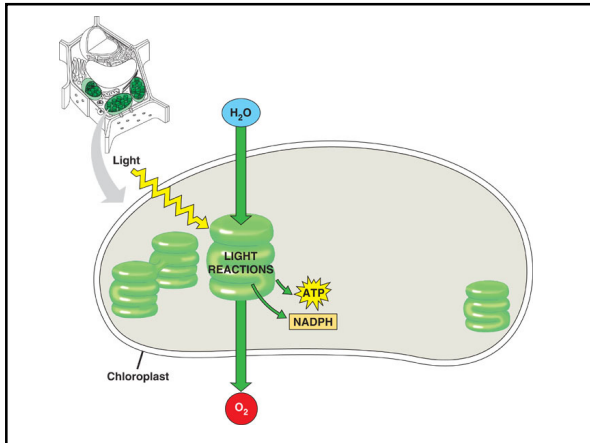
- Method of converting sun energy into chemical energy usable by cells
- **Autotrophs:** self feeders, organisms capable of making their own food
- Takes place in chloroplasts
 - Light absorbing pigment molecules e.g. chlorophyll
 - Leaves reflect green light

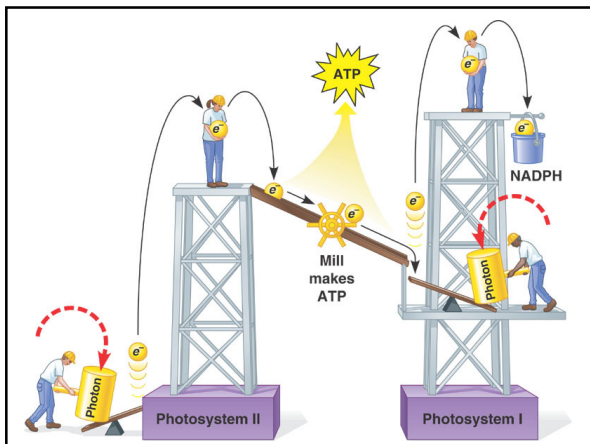
Overall Reaction

- $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- Water enters as a liquid leaves as a gas (transpiration)
- Two sets of reactions occur during this process
 - **Light Dependent** – Use energy from sunlight to create ATP and takes place in thylakoid's
 - **Light Independent** – ATP and NADPH molecules produce glucose without light. Takes place in the stroma. AKA Calvin Cycle

Light-dependent Reactions

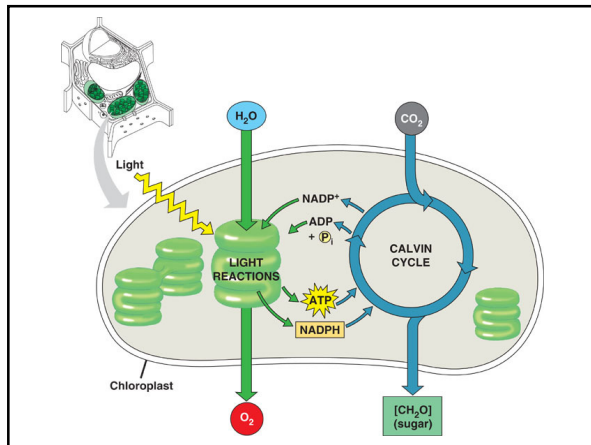
- In the thylakoids, chlorophyll and proteins create photosystems (I and II)
- **Photosystem II**
 - Light energy absorbed by chlorophyll produces high energy electrons
 - H_2O split to replace electrons and release H^+ and O_2
 - Electrons passed down ETC to Photosystem I
- **Photosystem I**
 - Electrons reenergized
 - 2nd ETC transfers electrons to NADP producing NADPH (electron carrier)
 - H^+ ions build up, need to pass through membrane, ATP synthase is used to move and transform ADP to ATP





Calvin Cycle (light independent or "dark" reactions)

- ATP and NADPH generated in light reaction used to fuel light independent reaction
 - CO₂ broken apart, then reassemble the carbons into glucose Carbon Fixation
 - Need 6 CO₂ molecules to form Glucose



FACTORS AFFECTING PHOTOSYNTHESIS

- Light, temperature and water
- Enzymes of photosynthesis function best between 0' & 35' C.
- Plants can perform under extreme conditions
 - C4 photosynthesis – high temperatures/intense light (Corn, sugar cane)
 - CAM plants – Dry climates obtain CO₂ and minimize water loss (cactus)

