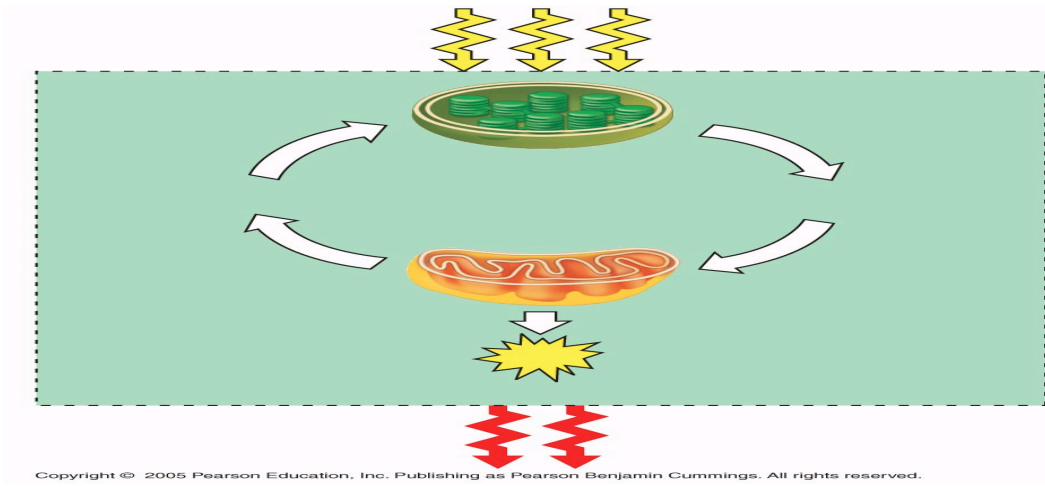


Unit 2: Cellular Organization and Processes

Section 2-4: Photosynthesis

Book Reading: Chapter 10 pages 181-198

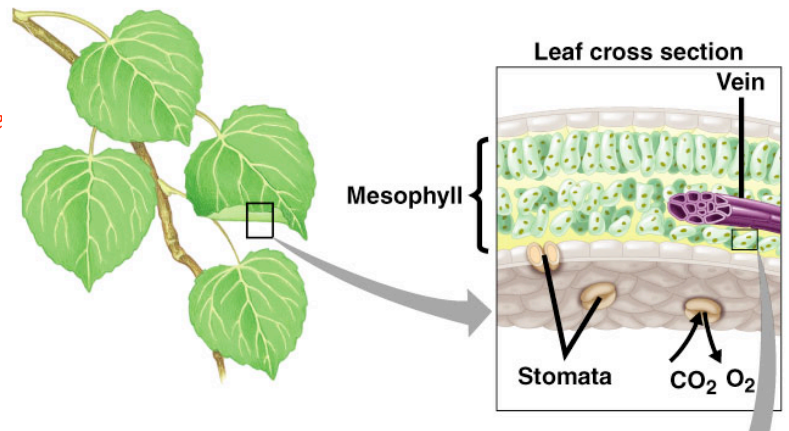
Ecological Significance *label the general reactants, products, structures, and processes in the following diagram.*



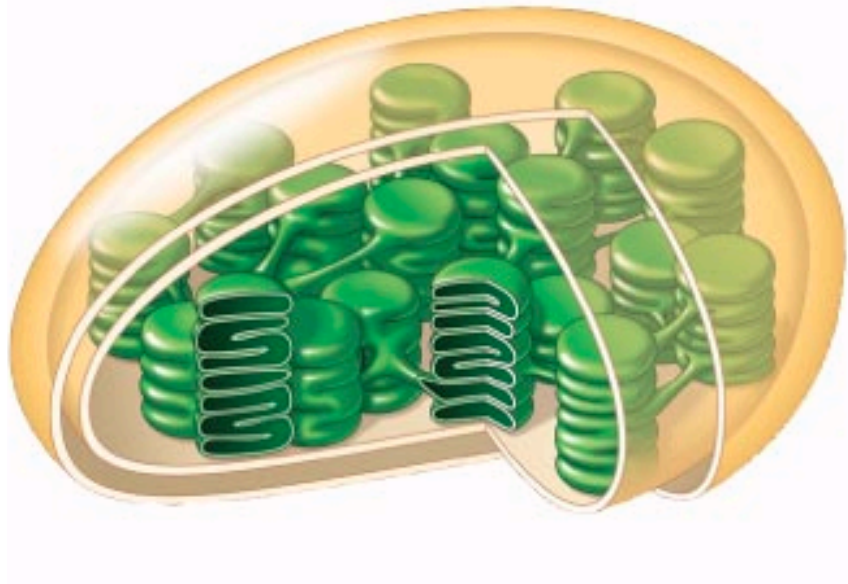
- ❖ Photosynthesis- *define*
- ❖ Autotrophs- *define*
 - Photoautotrophs- *define*
- ❖ Heterotrophs- *define*
 - Consumers- *define*
 - Decomposers- *define*

Chloroplast Structure

- ❖ Leaf Structure
 - The leaf is the major site of photosynthesis
 - Stomata- *define*
 - Mesophyll
 - *what is it? where is it located?*
 - *What important organelles are found here?*



- ❖ Chloroplast
 - Double membrane
 - Stroma- *define*
 - Thylakoids- *define*
 - Grana (granum)- *define*
 - Thylakoid space- *define*
 - Chlorophyll- *define*



Chemical Context of Photosynthesis

- ❖ General Equation: *write the general equation for photosynthesis*

- ❖ Redox reaction

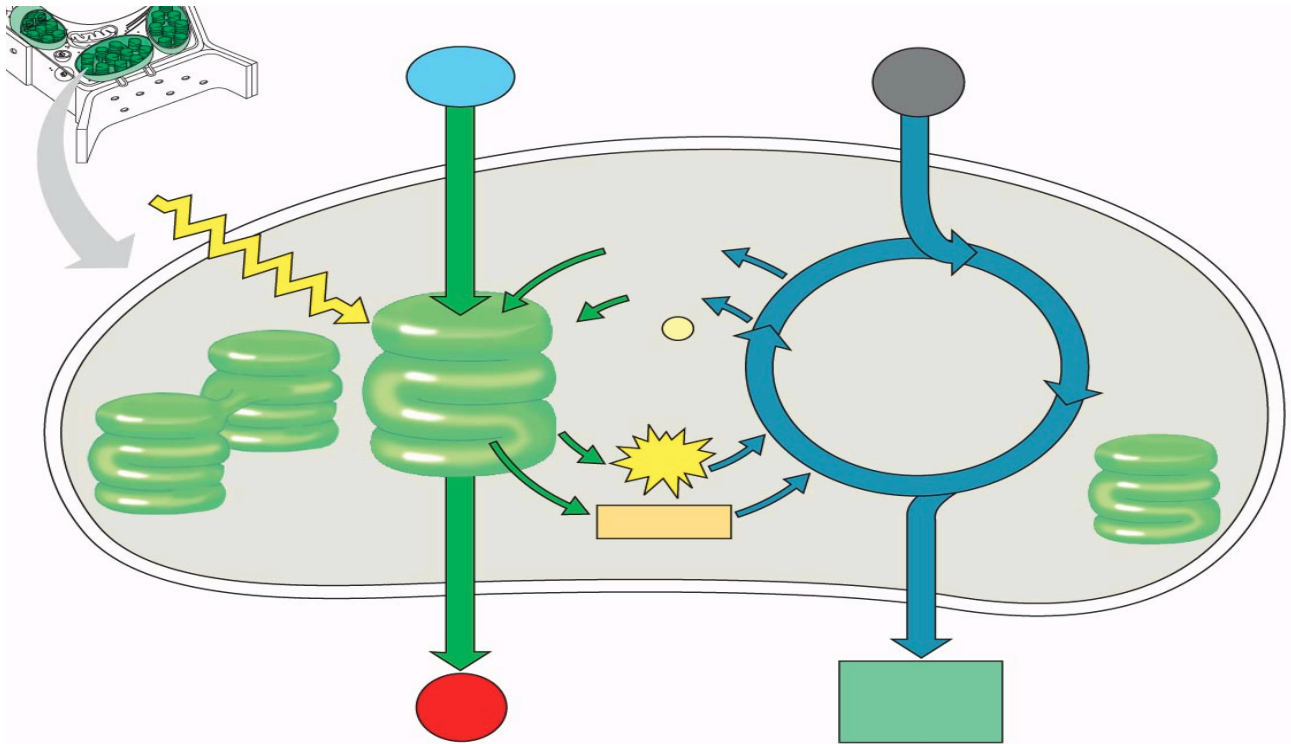
- ❖ Reverse of cellular respiration
 - Electrons increase in potential energy as they move from water to sugar
 - Anabolic reaction- *define*
 - Requires energy- *where does it come from?*

Light and Pigments

- ❖ Pigments- *define*
- ❖ Visible light-
- ❖ Absorbance vs. Transmittance/Reflection
 - Absorbance-
 - Transmittance-
- ❖ Plant Pigments
 - Chlorophyll *a*-
 - Chlorophyll *b*-
 - Carotenoids-
 - Major function of carotenoids=

The Big Picture of Photosynthesis

- ❖ Light Reactions
 - “*photo*”
 - also known as: Light Dependent Reactions
 - Location:
 - Input:
 - Output:
 - Reaction:
- ❖ Calvin Cycle
 - “*synthesis*”
 - also known as: Light Independent Reactions, Dark Reactions
 - Location:
 - Input:
 - Output:
 - Reaction:



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The Light Reactions

- ❖ Photosystems- a protein complex embedded in the thylakoid membrane that contains two parts
 - Reaction center- *define*
 - Light-harvesting complex- *define*
- ❖ Two Kinds of Photosystems
 - Photosystem II:
 - Special chlorophyll *a*- *which one is found in photosystem II?*
 - *Does this photosystem function 1st or second?*
 - Photosystem I:
 - Special chlorophyll *a*- *which one is found in photosystem II?*
 - *which one is found in photosystem II?*
- ❖ P680 and P700
 - very unstable when oxidized- electrons must be replaced immediately
 - P700 is replenished by electrons *from where?*
 - P680 is replenished by electrons *from where?*

❖ Noncyclic Electron Flow

PSII

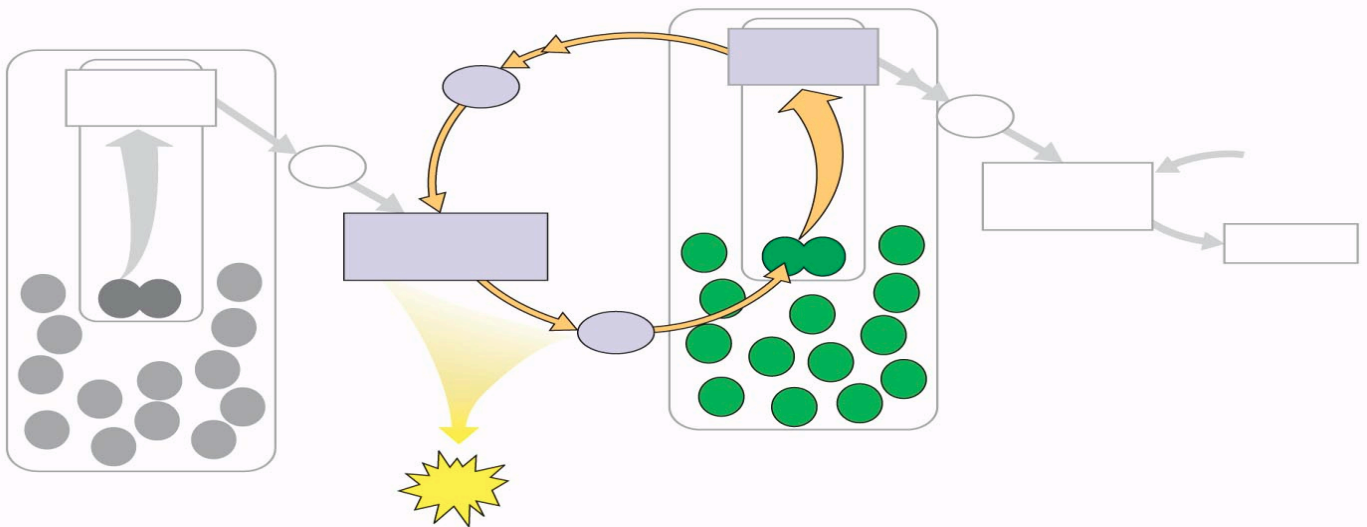
- photon of light is captured by pigments in the light-harvesting complex of PSII
- electron is excited and transferred from one pigment molecule to the next until it reaches P680
- the excited electron is passed from P680 to the primary electron acceptor (oxidizing P680 and reducing the primary electron acceptor)
- simultaneously, water molecules are split
 - electrons are released to replenish those lost by P680
 - H⁺ ions are released into the thylakoid space
 - O₂ is created and released
- the excited electron moves from the primary electron acceptor down the electron transport chain from plastoquinone (Pq) to the cytochrome complex (where energy is used to pump hydrogen ions from the stroma into the thylakoid space) to plastocyanin (Pc) and finally to replenish those lost by P700

PSI

- a photon of light is captured by pigments in the light harvesting complex of PSI
- electron is excited and transferred from one pigment molecule to the next until it reaches P700
- the excited electron is passed from P700 to the primary electron acceptor (oxidizing P700 and reducing the primary electron acceptor)
- the lost electrons from P700 are replenished with those moving down the electron transport chain from PSII
- the excited electrons are moved from the primary electron acceptor to ferredoxin (Fd)
- the enzyme NADP⁺ reductase then transfers the electrons from Fd to NADP⁺ to create NADPH

❖ Cyclic Electron Flow

-
-
-
-
-



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❖ Chemiosmosis in the Chloroplast

- Energy from
- Build up of H^+ occurs in
- Enzyme:

❖ Overall Result of the Light Reaction:

The Calvin Cycle

- ❖ Input:
- ❖ Output:
- ❖ Three Major Steps in the Cycle:
 - Carbon Fixation-
 - Reduction-
 - Regeneration of RuBP-

Back to the Big Picture of Photosynthesis

