Honors Biology
Photosynthesis & Cellular Respiration
Lecture Notes
Carmel High/Dooner

ENERGY, PHOTOSYNTHESIS, and RESPIRATION

- **PHOTOSYNTHESIS** is the main **ENERGY ACQUIRING** Pathway
- **CELLULAR RESPIRATION** is the main **ENERGY RELEASING** Pathway

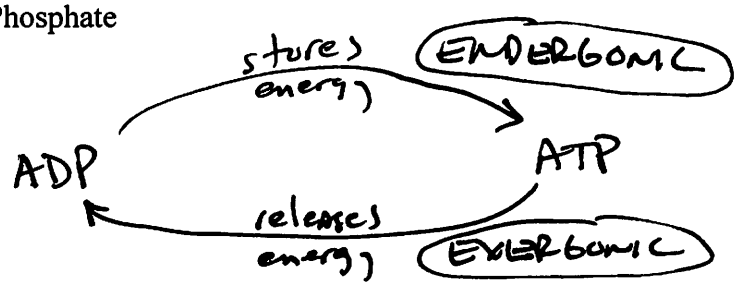
- Energy fuels "metabolism"

- **METABOLISM**: the summation of all the chemical reactions which occur in cells

ENERGY-CARRYING MOLECULES:

1) ATP- Adenosine Tri-Phosphate

- a nucleic acid
- a short-term energy carrying molecule that moves energy from one chemical reaction to another
- converts form from ADP(Adenosine DI- Phosphate) to ATP(Adenosine TRI-Phosphate



- when the third Phosphate is released, energy is released

2) Co-Enzymes:

a) NAD to NADH
b) FAD to FADH
c) NADP(in plants) to NADPH

- all of these molecules can carry hydrogens ions(instead of phosphate groups as in ATP) in order to store and release energy)

PHOTOSYNTHESIS

- **the conversion of LIGHT ENERGY into CHEMICAL ENERGY which gets STORED in COVALENT BONDS**
- **the END PRODUCTS of Photosynthesis(Glucose and Oxygen) become the starting point of Cellular Respiration**
- **the END PRODUCTS of Cellular Respiration(Carbon Dioxide and Water) become the starting point of Photosynthesis**
- **Priestly's "Bell Jar" experiments looked at the impact of placing a candle in a bell jar with a mouse and the impact of a candle and a plant in the bell jar with the mouse**

PIGMENT MOLECULES:

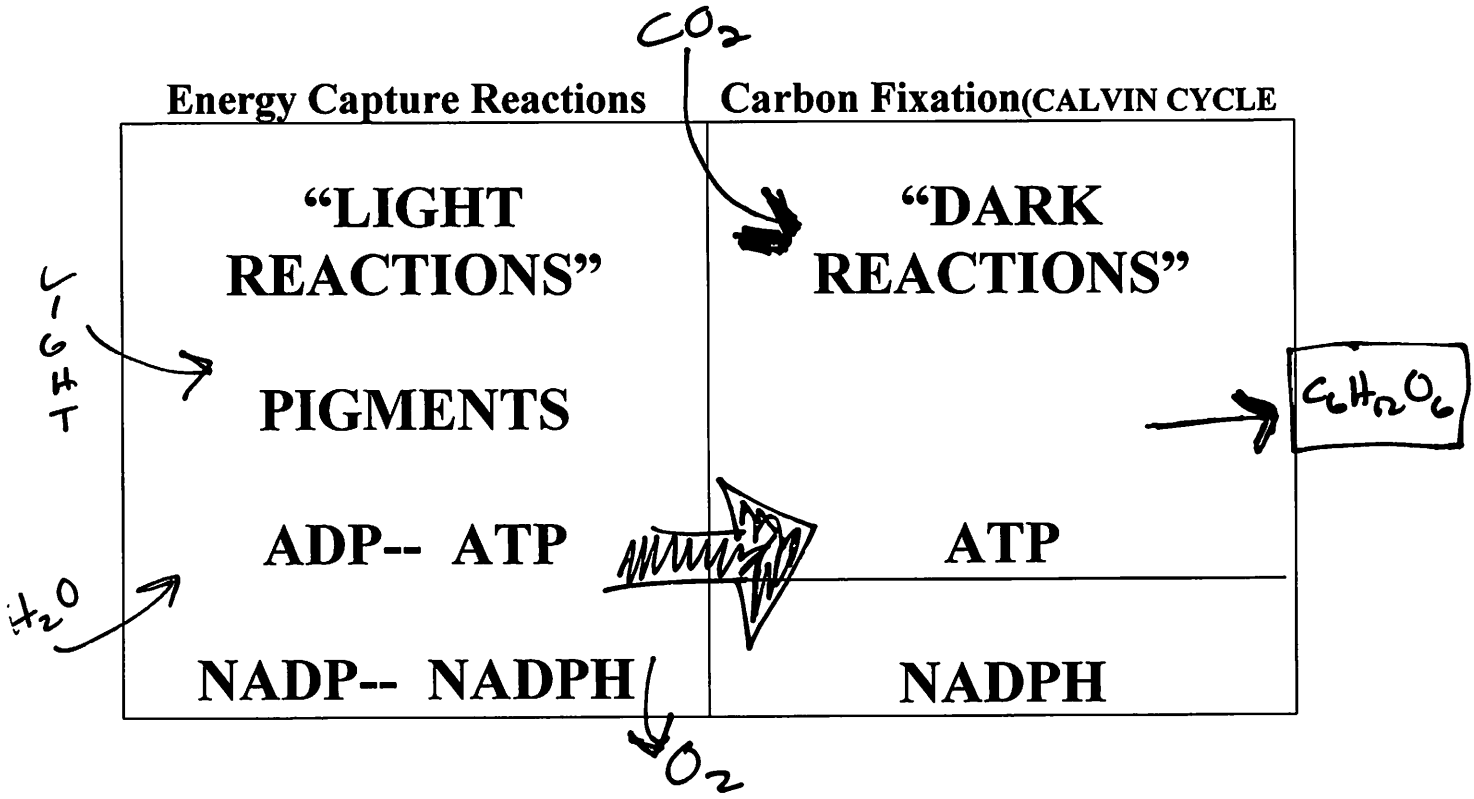
- **any kind of molecule that absorbs LIGHT of some wavelengths and reflects light of other wavelengths**

CHLOROPHYLL:

- **main photosynthetic pigment in plants**
- **located inside CHLOROPLASTS**
- **not water soluble**
- **uses all light EXCEPT the "green" wavelengths**

CAROTENOIDS:

- **accessory pigments**
- **capture light in the violet, blue, and green spectrum and therefore are visible as yellow, red, and orange**
- **the type of light energy that is absorbed by all of these pigments then sets up a CHAIN OF CHEMICAL REACTIONS**



Thylakoid Membranes:

- they have chlorophyll molecules embedded in them
- they are located inside the chloroplast(in the granum)
- **LIGHT REACTIONS OCCUR HERE**

Stroma:

- the liquid INSIDE the chloroplast where **CARBON FIXATION takes place**

ENERGY CAPTURE:	CARBON FIXATION:
1) Light hits chlorophyll; some wavelengths are absorbed	1) A complex set of reactions begins which links Carbon Atoms together(CO_2) was the source
2) Light energy gets transferred to molecules	2) ATP and $NADPH_2$ from the Light Reactions(Energy Capture) are used to "DONATE" energy to form CHEMICAL BONDS
3) H_2O splits!- this sets up reactions where electrons move and O_2 is released as a by-product	3) **GLUCOSE IS MADE!!!!!!**
4) Electron movement generates ATP and $NADPH_2$	

Importance of Photosynthesis for Life:

1) **GENERATION OF OXYGEN**

2) **SOURCE OF ENERGY for:**

Autotrophs ---------organic molecules--------> **Heterotrophs**

- **Plants**
- **Algae**
- **Cyanobacteria**

* **animals**
* **fungi**
* **protists/bacteria**

3) **SOURCE OF CARBON for the creation of ORGANIC MOLECULES(carbon dioxide is the source of the carbon in the organic molecules of plants- remember Van Helmont!)**

EQUATION FOR PHOTOSYNTHESIS:

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

Honors Biology
Chapter 8
Photosynthesis
"Using Visuals"

INSTRUCTIONS: With a partner, analyze Figure 8-7 on page 209 and answer the following questions:

1. What materials come into the chloroplast that are used in the light-dependent reactions? _____
2. What material comes into the chloroplast that is used in the Calvin cycle?_____
3. What material moves out of the chloroplast from the light-dependent reactions?_____
4. What materials move out of the chloroplast from the Calvin cycle?_____
5. What materials move from the light-dependent reactions to the Calvin cycle?_____
6. What materials move from the Calvin cycle back to the light-dependent reactions?_____

Analyze Figure 8-11 on page 212 and answer the following questions about the Calvin Cycle:

1. Where does the Calvin Cycle take place?_____
2. What enters the Calvin Cycle from the atmosphere?_____
3. Where do the ATP and NADPH come from?_____
4. What is the product of this cycle?_____
5. What happens next to the 3-carbon molecules?_____
6. How is the cycle completed?_____