

## Chapter Six: Photosynthesis

All life carries out cellular respiration to release energy.  
Only autotrophs carry out photosynthesis.

\*\*\*\*\*The photosynthesis reaction is:



VIDEO: How do plants make fuel to feed their mitochondria?

VIDEO: How do animals get fuel to for their mitochondria?

6-1

1. Label the following: chloroplast, granum /grana, stroma, thylakoid

A.

B.

C. (One)

D. (Entire Stack)

2. Name the colors of the visible spectrum.

VIDEO: Chlorophyll absorbs what colors of the light spectrum?

VIDEO: What color is reflected by the plant?

VIDEO: What color does this reflected light make the plant?

VIDEO: Light energy is changed to what kind of energy by the chloroplast?

3. What is the job of a pigment in a plant? What is the most prominent pigment in most plants?

4. What is the job of carotenoids and the rest of the accessory pigments in plants?

5. What happens in the fall?

6. What is a photosystem?

7. Where does the light reaction take place in a plant?

## PHOTOSYNTHESIS:

Step 1. Light Reaction: requires the presence of light, takes place in thylakoids

- A. Begins when pigments (chlorophyll, etc...) in Photosystems I and II absorb light energy.
  - B. Light energy absorbed causes electrons to enter a higher energy level. They are excited.
  - C. The excited electrons leave the chlorophyll in Photosystem I and enter the electron transport chain.
  - D. Electrons that were lost in Photosystem I are replaced by Photosystem II. This keeps everything neutral.
- Photosystem II:
- E. NADPH is produced. It will be used for energy.
  - F. Water molecules are split into hydrogen and oxygen. Electrons produced here replace electrons lost in photosystem II. Oxygen is released as a waste gas!!!
  - G.  $H_2$  ions are used in chemiosmosis to synthesize ATP for the Calvin cycle--> Step Two.

VIDEO: What two molecules are produced to provide the energy for photosynthesis?

6-2

Step 2. Calvin Cycle (sometimes called the dark reaction): does not require the presence of light

- A.  $CO_2$  diffuses into stroma. RuBP is made. RuBP splits into 2 PGA molecules.
- B. ATP (from the light reaction) + PGA forms PGAL.
- C. Some PGAL is converted back to RuBP to keep the Calvin Cycle going. The rest of the PGAL is used to make amino acids, lipids, and carbohydrates. Carbohydrates made include: glucose, fructose, sucrose, glycogen, starch, and cellulose.

8. What is the Calvin cycle named for?

9. In the Calvin cycle,  $CO_2$  is \_\_\_\_\_.

10. What is carbon fixation?

11. The Calvin cycle occurs in \_\_\_\_\_.

12. What are C3 plants?

13. Plants that evolved in hot, dry climates use an alternative pathway to fix carbon. What is it called? Give examples of these plants. What is the advantage to this pathway?

14. Cactuses and pineapples use the pathway called \_\_\_\_\_.

Their stomata are open \_\_\_\_\_ to let in  $CO_2$  and are closed \_\_\_\_\_.

15. Name three things that affect the rate of photosynthesis.

16. What is the difference between an autotroph and a heterotroph?

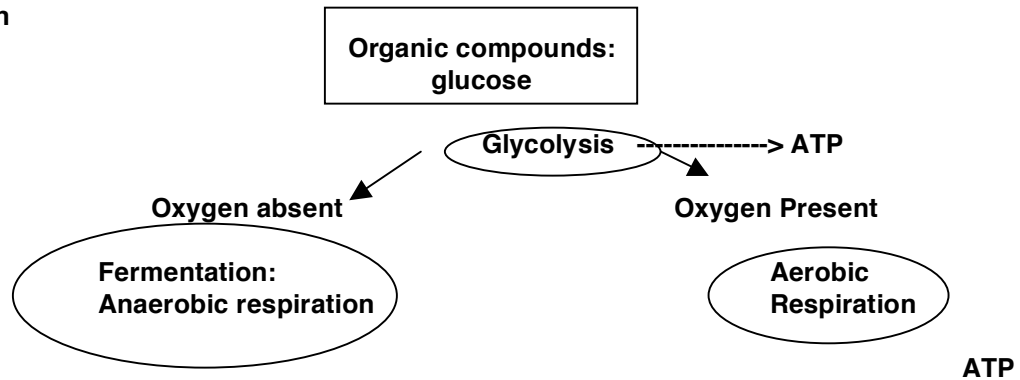
17. How important is photosynthesis? What does it do?

18. How is glucose stored in a plant?

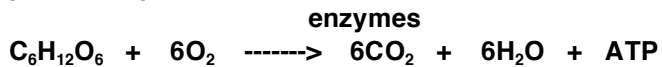
VIDEO: What organelle gives off  $CO_2$ ? What organelle uses this  $CO_2$ ?

## Chapter 7: Respiration

### 7-1 Respiration



Respiration equation:



What controls respiration and photosynthesis?

VIDEO: What requires energy in living things?

VIDEO: What kind of energy is used in cells?

VIDEO: Where is this energy found?

VIDEO: What releases energy from ATP? What is left?

VIDEO: Recharging ADP to ATP takes lots of energy. This energy come from \_\_\_\_\_.

Respiration Step One. Glycolysis:

1. Controlled by enzymes
2. Takes place in the cytosol of the cell
3. Breaks apart glucose.
4. Two molecules of pyruvic acid are produced. Four ATP are produced but 2 ATP are required to break apart the pyruvic acid. Net gain is 2 ATP.

Respiration Step Two: Anaerobic OR Aerobic

Anaerobic pathway=fermentation: Two kinds of fermentation-lactic acid or alcoholic

I. Lactic Acid Fermentation:

1. An enzyme breaks pyruvic acid into lactic acid. NO ATP is made.
2. NAD is made and is used to keep glycolysis going to continue to make ATP.

OR II. Alcoholic Fermentation:

1. Pyruvic acid is broken down into ethyl alcohol. No ATP is made.
2. NAD is made and is used to keep glycolysis going to continue to make ATP.

1. Lactic acid fermentation is carried out by microorganisms. What is produced?

2. Lactic acid fermentation is also carried out by our muscles during strenuous exercise. The production of acid in our cells results in what?

3. What does our body do to get rid of the lactic acid?

4. Alcoholic fermentation is carried out by yeast. What products are produced?
5. How efficient is anaerobic respiration?
6. Why do larger animals carry out aerobic respiration rather than anaerobic?
7. What food products do we get from the following:
  - a. alcoholic fermentation
  - b. lactic acid fermentation

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**Respiration Step Two: Aerobic Pathway**

1. Takes place in the cytosol of prokaryotes and in mitochondria of eukaryotes.
2. Krebs cycle. (Name for Hans Krebs)
  - Pyruvic acid reacts with coenzyme A to form acetyl CoA.
  - Acetyl CoA enters the Krebs cycle.
  - After many reactions in the Krebs cycle, CO<sub>2</sub> and 2 ATP are produced.
  - FADH and NADH are produced.
3. Electron transport chain.
  - High energy electrons from FADH and NADH produced in the Krebs cycle synthesizes ATP.
  - Hydrogen ions (protons) pass across membranes producing ATP by chemiosmosis.
  - Oxygen keeps this process going. 34 ATP are made.

7. How efficient is aerobic respiration?

8. How efficient is an automobile engine?

**Summary of Respiration:**

**Anaerobic respiration:**

1. glycolysis	2 ATP
2. fermentation (lactic acid or alcoholic)	<u>0 ATP</u>
Total energy produced	2 ATP

**Aerobic respiration:**

1. glycolysis	2 ATP
2. aerobic respiration:	
Krebs cycle	2 ATP
Electron transport chain	<u>34 ATP</u>
Total energy produced	38 ATP

\*\*\*\*\*RESPIRATION IS CARRIED OUT BY ALL LIVING THINGS