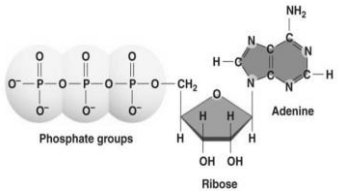
CELL ENERGY CRIB SHEET

Tiny pores on the surface of plants are called **stomata** and they are important because they provide the plant with CO_2 for photosynthesis.

Pigments are a substance that absorbs certain wavelengths or light and reflects others. They can be found in **chloroplast**

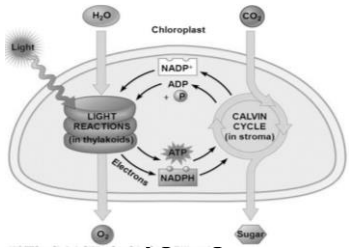
Light-independent reactions make **ATP** for the cell.

An ATP Molecule:



An ATP Molecule:
In order for energy to be released from at ADP/ATP molecule, the chemical bonds between the **2nd and 3rd** phosphate groups will be broken or made.

The **Calvin Cycle** *does not* require light!

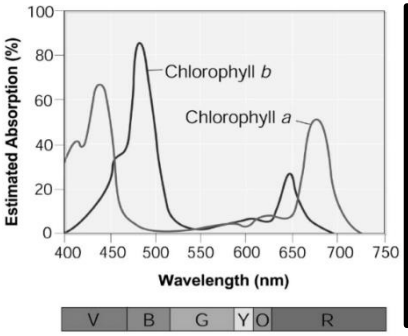


produced, it converts ADP and NADP+ into energy carriers **ATP** and **NADPH.**

High energy electrons are used to help build molecules such as carbohydrates like **glucose** for the cell.

Photosynthesis Equation

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

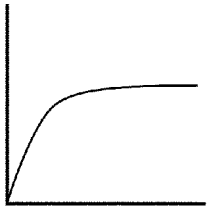


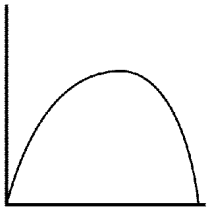
*Most **visible** color is green.
* Least visible color is violet and red because plants (chlorophyll) **absorb** those colors and **reflect** green and yellow.

The purpose of **water (H_2O)** is to supply electrons for the electron transport chain. After water splits, the H+ ion helps the electron carriers (NADPH) get the electrons through the ETC.

Photosynthesis is the ability to convert energy from the sun into chemical energy used by plants. Much of this chemical energy is stored in the bonds of **glucose ($C_6H_{12}O_6$)**

The sequence of Photosynthesis:
Light absorption ➡ chlorophyll captures the light energy ➡ water splits giving off O_2 ➡ light dependent reactions begin ➡ Electron Transport chain ➡ high energy electrons and the H+ from water are carried by NADPH to the stroma to be used for light independent reactions (Calvin Cycle) ➡
The Calvin Cycle can begin ➡ High energy electrons and H+ are combined with CO_2 in 6 rotations to make $C_6H_{12}O_6$ (glucose) ➡ Low energy electrons are returned to the thylakoid to start all over





Limiting Factors that would cause this graph would be, **CO_2 concentration**, and **light intensity**

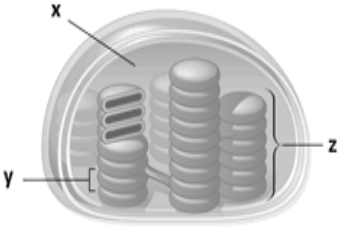
Temperature is another factor that affects photosynthesis as the enzymes function best between 32°F and 67°F

If **chlorophyll** is most abundant, that means there is a higher concentration of that particular pigment!

Leaves tend to be flat on plants or trees to allow for sunlight to penetrate the photosynthetic tissue.

When plants were only exposed to **green light**, CO_2 in the air would most likely increase.

Photosynthesis takes place in the **CHLOROPLAST** of plant and tree cells.



X is the **stroma**, where light independent reactions (**Calvin Cycle)** occur.
Y is the **thylakoids** where *light Dependent reactions occur.*
Z are stacks of thylakoids called **grana**

Limiting Factors affect the rate of photosynthesis (increases it) until it reaches a maximum rate of production before photosynthesis slows down or stops all together

If CO_2 was removed from a plants environment, fewer or no sugars would be produced.

Cellular (aerobic) respiration is a synonym for **breathing**.

#1 Glycolysis: takes place in the *cytoplasm* of the cell and is the 1st step in cellular respiration.

Glycolysis is the process in which one molecule of **glucose** is broken in half producing two molecules of **pyruvic acid**.

Since the bonds of energy are locked into pyruvic acid, glycolysis depends on the greatest electron acceptor of all, **OXYGEN** to generate energy!

#3 Electron Transport Chain (ETC): The Krebs Cycle generates high-energy electrons that are passed to **NADH** and **$FADH_2$** (electron carriers). The electrons are then passed from those carriers through the ETC.

The ETC uses the high energy electrons to convert ADP to ATP.

On average, each pair of electrons provide enough energy to produce **3** ATP molecules.

Earth's Early Atmosphere: At **Earth's** beginning, there was little, to no oxygen. The cells that used the **anaerobic** process had to learn how to function without oxygen. There were many **anaerobic respiration** processes taking place, since all organisms need oxygen to survive.

Prokaryotic cells: dominated the Earth for a while before eukaryotes.

Cellular Respiration (aerobic) Equation

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

Sequence of Cellular (aerobic) respiration
Glycolysis **(2 ATP)** ➡ Krebs Cycle **(2 ATP)** ➡ Electron Transport Chain **(32 ATP)**

If oxygen is **NOT** present after glycolysis, it is followed by a pathway called **fermentation.**

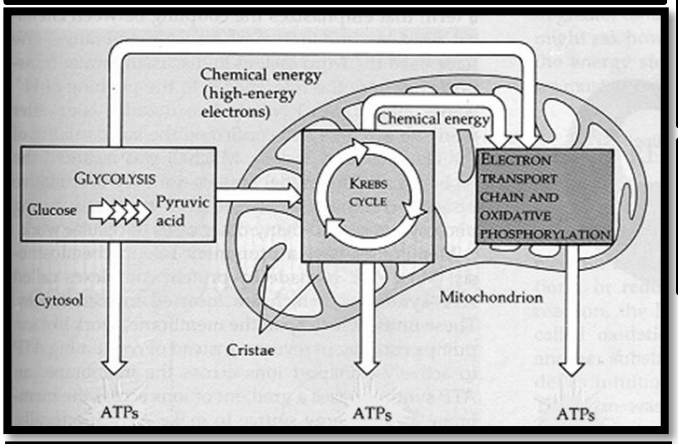
Fermentation releases energy from food molecules by producing ATP in the absence of oxygen. During fermentation, cells convert NADH to NAD+ by passing high-energy electrons back to **pyruvic acid.**

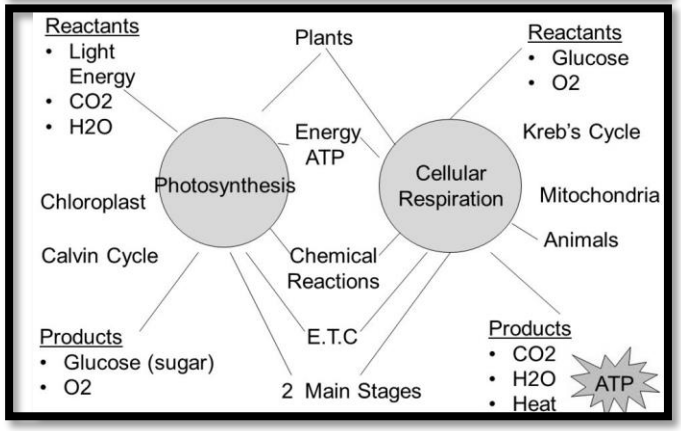
Anaerobic: means oxygen is not present "in the air."

#2 Krebs Cycle: IN THE PRESENCE OF OXYGEN, move into the **mitochondria,** where pyruvic acid gets broken down into CO_2 in a series of energy extracting reactions.

Krebs Cycle is also known as the **citric acid** cycle as it is the first compound made.

CO_2 is released and **ATP** is produced to run cellular activities.





Cellular (aerobic) respiration takes place in the **mitochondria** of animal cells.

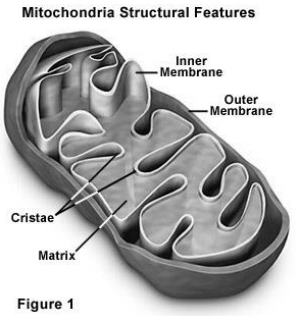


Figure 1

Plants also undergo Cellular Respiration.

Two Types of Fermentation:

1. **Alcoholic Fermentation:** *Yeast* and a few other microorganisms do this. It is what makes bread rise. **Products produced:** ethyl alcohol, ATP, and CO_2

2. **Lactic Acid Fermentation:** pyruvic acid accumulates and NAD+ regenerates so that glycolysis can continue.

The buildup causes your body to become sore, hot, and give a burning sensation.

Efficiency:
38% represents the energy from glucose
62% is released as heat.

Photosynthesis vs Cellular Respiration is pictured in the center, at the bottom of the page.

Note that what they share in **common** is in the **middle** and the **differences** is on the **outsides**!