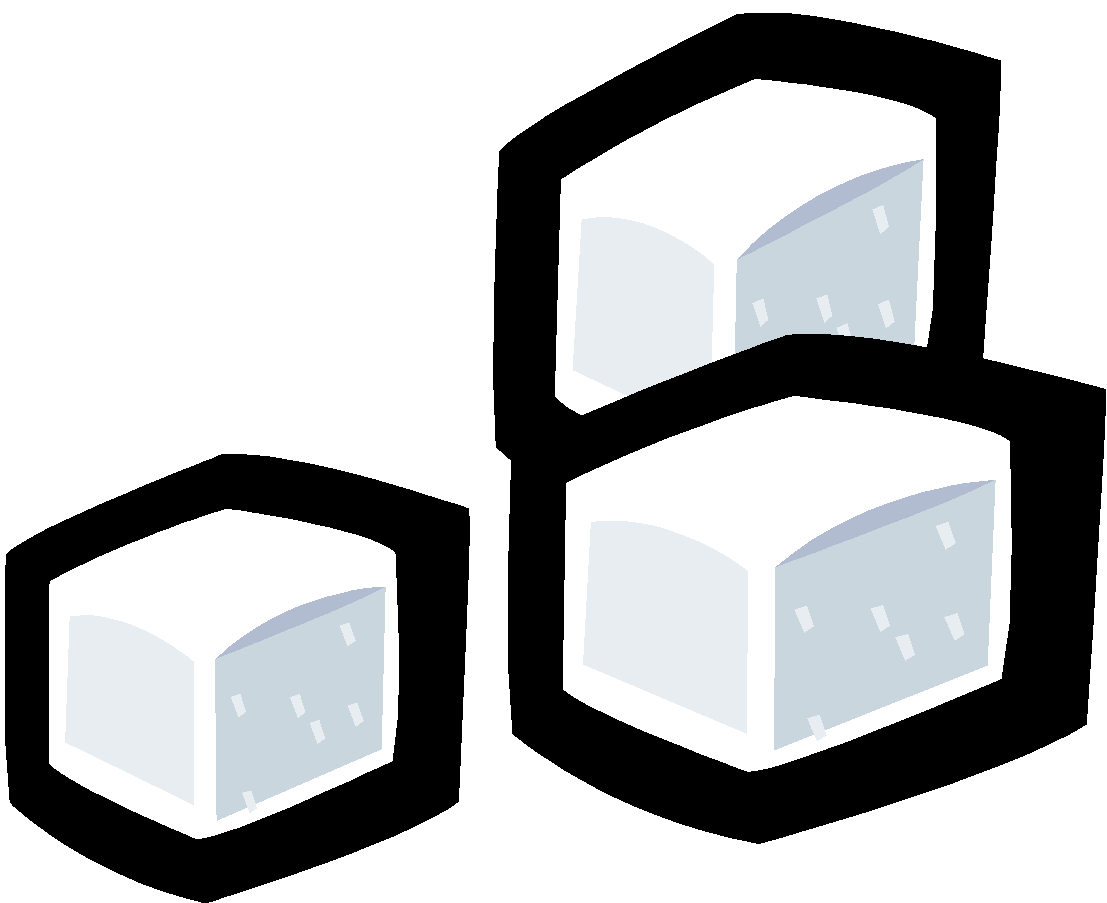
Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_

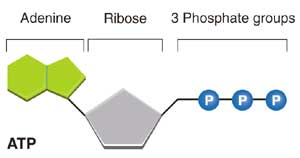
**Photosynthesis Notes**

**Cellular Energy**

* The cell will store energy in molecules like \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_\_\_
  + Most cells have \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_ \_\_\_\_\_ that only last a few seconds, but cannot store energy there long-term.
  + Cells will store energy long term in \_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_

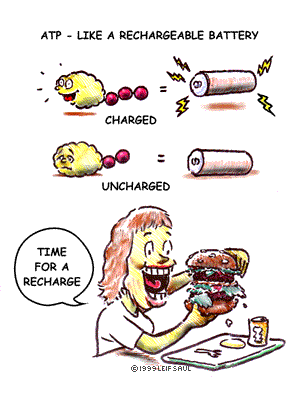
\_\_\_\_\_\_\_\_\_ energy  > \_\_\_\_\_ energy

90x greater

**Structure of ATP**

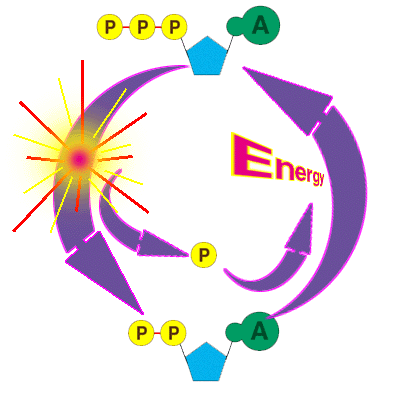
Structure- the Adenosine Triphosphate \_\_\_\_\_\_ molecule has three parts:

* + 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (a nitrogen-containing molecule)
  + 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (a five-carbon sugar)

The adenine bonds to ribose, forming \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

* + 3. three \_\_\_\_\_\_\_\_\_\_\_\_\_\_ groups

**Function of ATP**

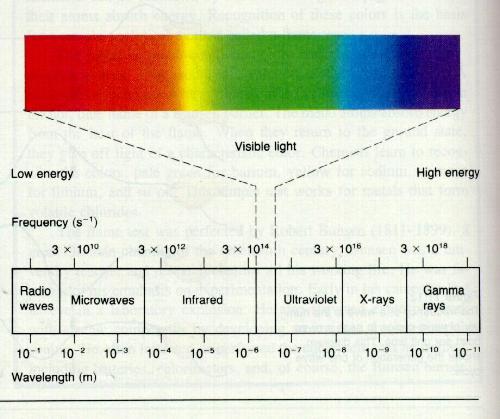
* ATP stores energy in the \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_ groups (high-energy bonds)

**ATP-ADP CYCLE**

* ATP is the \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_l.
* When the bond between two phosphates is broken, phosphate is removed and \_\_\_\_\_\_\_\_\_\_\_ \_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_.

**Light and Pigments**

**CO2** + 6 **H2O** -- ***light-->***  **C6H12O6** + 6 **O2**

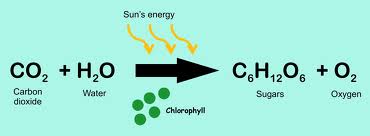
* **Photosynthesis starts with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**!
* The light that comes from the sun is \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ and includes all the colors of the \_\_\_\_\_\_\_\_\_\_ spectrum, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **There are also other pigments, beside chlorophyll a, called**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* **Each pigment has its \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **for absorption** **and to fuel PS**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_ is the \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ for PS, while the accessory pigments help**

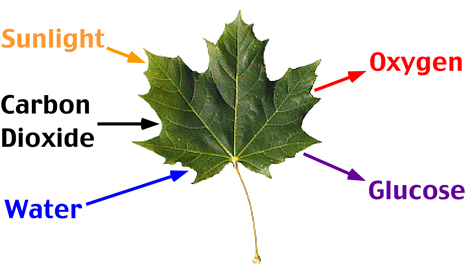
**chlorophyll a by the portion of ROYGBIV it can use!**

**Types of Pigments**

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**– the primary light-absorbing agent for photosynthesis
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – yellow & orange pigments
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – red and blue

**What is Photosynthesis?**

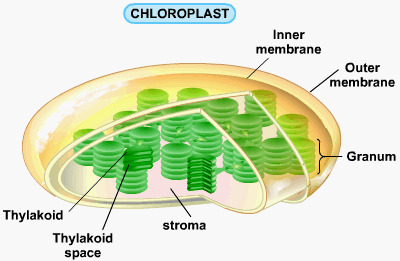
* Plants **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the energy of sunlight into the energy in the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ of carbohydrates – sugars and starches



**Requirements for Photosynthesis**

* \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = CO2
* \_\_\_\_\_\_\_\_\_\_\_\_\_ = H2O
* \_\_\_\_\_\_\_\_\_\_\_\_\_ = In the form of sunlight
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = to capture energy from the sun

**Where does Photosynthesis occur?**

* Inside plant cells – specifically \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – flattened, membrane bound sac
* \_\_\_\_\_\_\_\_\_\_\_\_\_ – stacks of thylakoids
* \_\_\_\_\_\_\_\_\_\_\_\_\_ - green pigment in the thylakoid
* \_\_\_\_\_\_\_\_\_\_\_\_\_ – fluid matrix

**Photosynthesis Reaction**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**The Leaf**

* \_\_\_\_\_\_\_\_\_\_\_\_- the waxy outer covering of a leaf that \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_-layer of long cells where \_\_\_\_\_\_\_\_\_\_\_\_ are found and where most of PS occurs
* \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_-random collection of cells with large spaces in between them. Some

PS occurs here, but mostly this is where the \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ in & \_\_\_\_\_\_\_\_\_\_\_\_off by PS are between palisade layer and stoma

* \_\_\_\_\_\_\_\_\_\_\_\_- openings on the underside of leaves that allow for gas exchange between the leaf and atmosphere.
* \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_- the cells on either side of the stoma that open/close them to let gases in or out OR to keep gases in

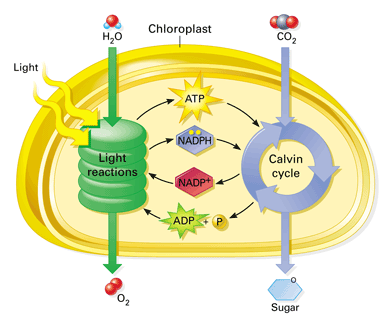
**Stages of Photosynthesis**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**PS occurs in 2 parts**

* 1. **\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ (or Light reaction**)
     + **This part of the reaction requires LIGHT, H2O, and gives off O2**
  2. **Light Independent (or Dark Reaction) also known as the Calvin Cycle**
     + **This part of the reaction requires CO2 and produces the sugar or glucose**

**Step 1 - Light -Dependent Reaction/ Light Reaction**

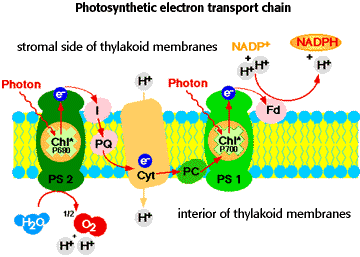
Light energy is absorbed, \_\_\_\_\_\_\_\_\_\_ is split, \_\_\_\_\_ is produced, high energy molecule \_\_\_\_\_\_\_\_\_\_\_\_\_ is formed, and \_\_\_\_\_\_\_\_\_\_\_\_ is released as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Light-Dependent Reaction**

4 Basic Processes

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**THE PROCESS OCCURS IN THE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!!**



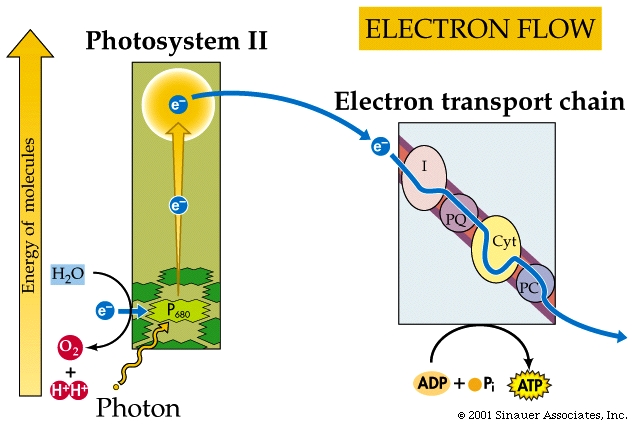
**Electron Carriers - NADPH**

* Excited electrons – \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Special carriers – \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Electron transport chain

NADP+ - accepts and holds 2 high energy electrons along with a hydrogen ion (H +)

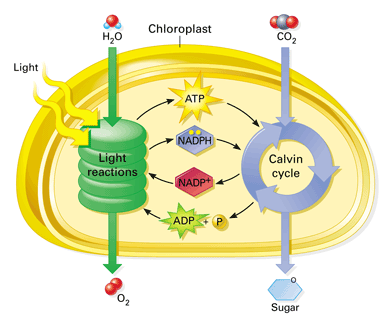
* NADP+ + H + = \_\_\_\_\_\_\_\_\_\_\_\_\_

**Light-Dependent Reaction cont.**



**Step 2 Dark reaction / Light-independent reaction/ Calvin cycle = Producing sugars**

* \_\_\_\_\_\_\_ enters the calvin cycle
* Chemical energy (\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_ is converted to \_\_\_\_\_\_\_ sugars that can be stored \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_.



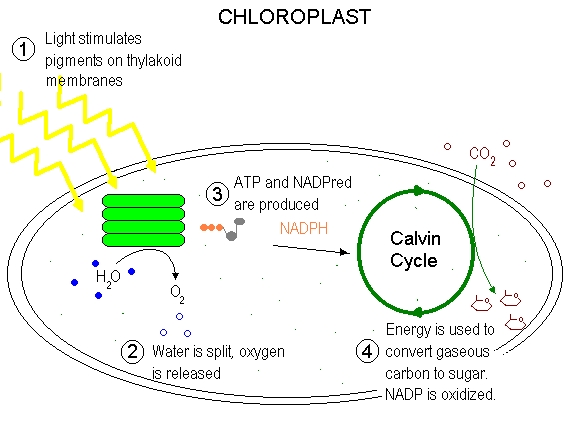
1 Basic Process

Production of stable, high energy sugars such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!

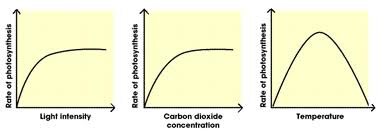
**THE PROCESS OCCURS IN THE STROMA!!**

* Plants use the energy that \_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_ contain to build high-energy \_\_\_\_\_\_\_\_\_\_\_\_\_ that can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for a long time.
* Uses ATP and NADPH from the light \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_reactions to produce high-energy sugars that can be.

**A Summary of photosynthesis:**

**Factors that affect photosynthesis**

\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

******

\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

**Chemosynthesis**

Photosynthesis and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are both processes by which organisms produce food; photosynthesis is powered by sunlight while \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is powered by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

Chemosynthesis is at the heart of \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_, sustaining life where \_\_\_\_\_\_\_\_\_ does not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

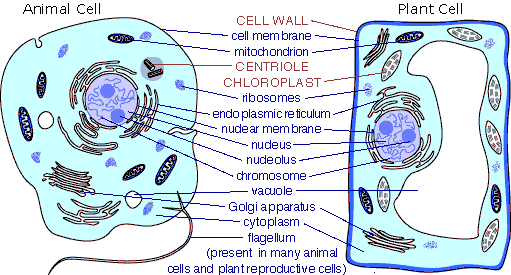
Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_

**Cellular Respiration**

**Cellular Respiration - An Overview**

**Cellular Respiration Equation**

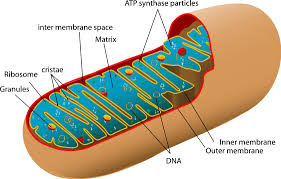
**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

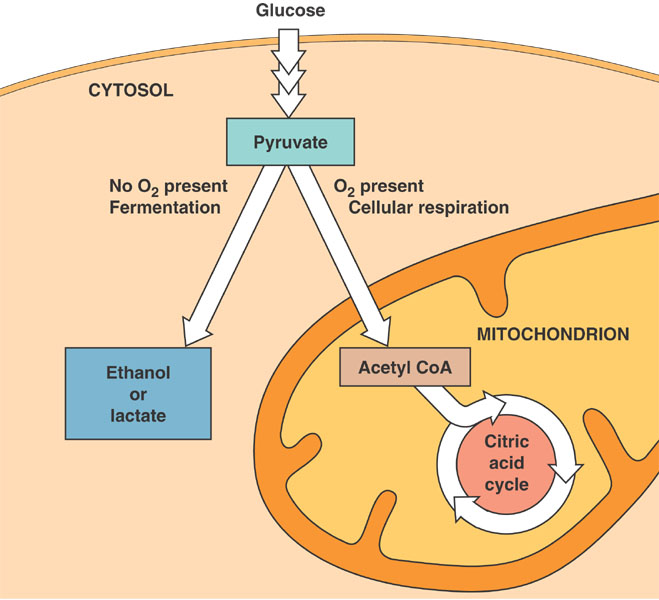
**Cytoplasm -** \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ of the cell; where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs 

**Mitochondria** - \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_ occur here; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ glucose to \_\_\_\_\_\_\_.

**Structures of Cellular Respiration - Mitochondria**

**The Mitochondria**

* In almost all \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells
* **Where \_\_\_\_\_\_\_\_\_\_\_\_\_ respiration occurs**
* **\_\_\_\_ membranes**
* **Nearly all** your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **come from your mother**
* **Has its \_\_\_\_\_\_ DNA** that is different from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DNA
* Has its own \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Reproduces by \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in two

**Glycolysis** –takes place in the \_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 

**Kreb Cycle**-takes place in the \_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ETC-**takes place in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Fermentation**-takes place in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 1 - Glycolysis**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - the process by which **1 \_\_\_\_\_\_\_\_\_\_\_\_ (C6H12O6) is**

\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_by ½ **making 2 pyruvic acids/pyruvates**

* **\_\_\_\_\_\_\_\_\_\_\_\_\_ amounts of \_\_\_\_\_\_\_ made, but it can be produced very quickly**
* **Investment of 2 ATP to produce 4 ATP, so** \_\_\_\_\_ \_\_\_\_\_\_\_ **is 2 ATP**
* **Can produce \_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_ per millisecond**
* **Since oxygen is not needed, \_\_\_\_\_\_\_\_\_\_\_\_\_\_ can supply \_\_\_\_\_\_\_\_\_\_ to the cells even if** \_\_\_\_

\_\_\_\_ **is present.**

**Step 2 in the absence of oxygen -** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ means in the absence of oxygen
* **If there is no oxygen, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ follows \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (anaerobic respiration)**
* **fermentation**- the process by which the cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to create \_\_\_\_\_\_ from

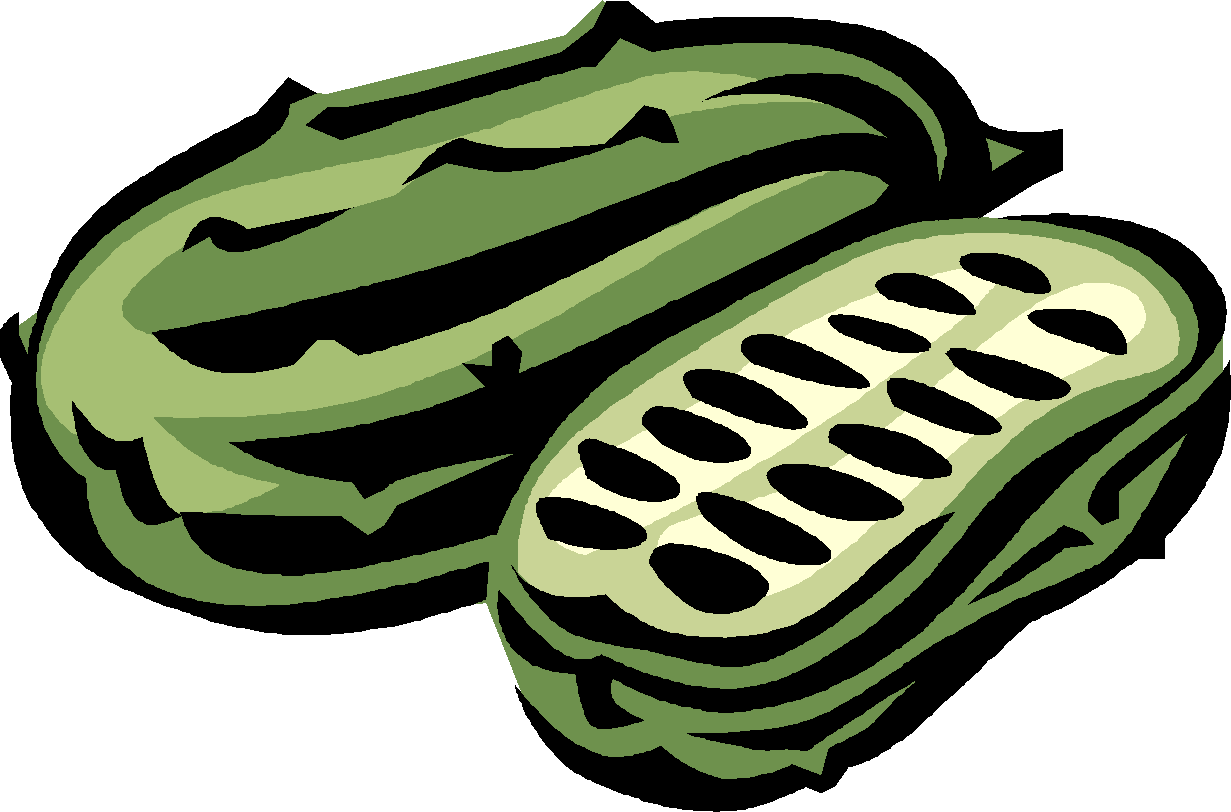
\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ oxygen (O2). Produces \_\_\_ ATP.

**Step 2 in the absence of oxygen - Fermentation**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fermentation**

**Who does it?**

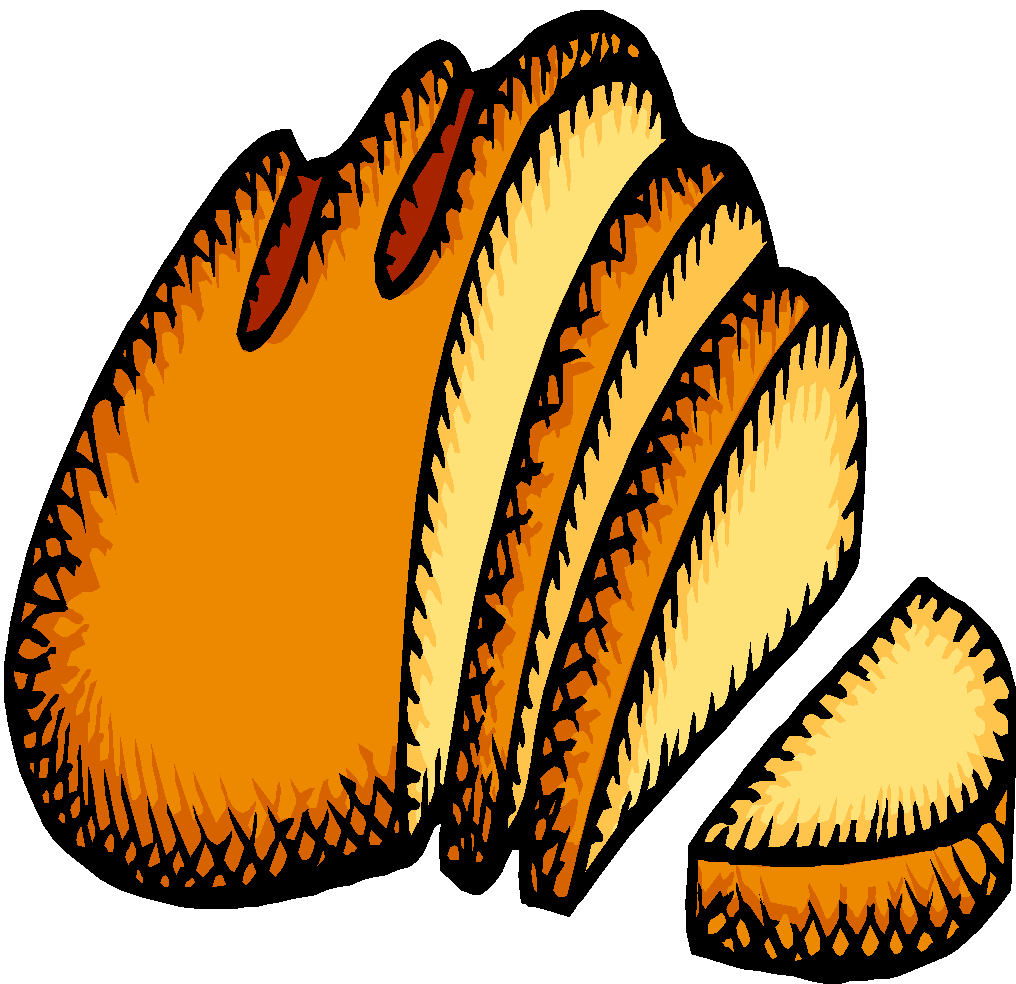
**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cells and some **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* **In these cells it will create a strong \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_\_\_\_** 
* **Converts** \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ **and** \_\_\_\_\_\_\_\_\_ **+**
* **Products**
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,**
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Alcoholic Fermentation**

**Who does it?**

**\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_ organisms**

* **Will cause bread to \_\_\_\_\_\_\_\_\_\_\_**
* **Converts**\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_**, CO2, and H2O**
* **Products**
  + **Beers**
  + **Wines**
  + **Breads**

**Step 2 in the presence of oxygen - Krebs cycle**

* \_\_\_\_\_\_\_\_\_\_ means in the \_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_
* The **\_\_\_\_\_\_\_ \_\_\_\_\_\_\_ is Step 2 when O2 is \_\_\_\_\_\_\_\_\_\_** and a place for carrier molecules to drop off

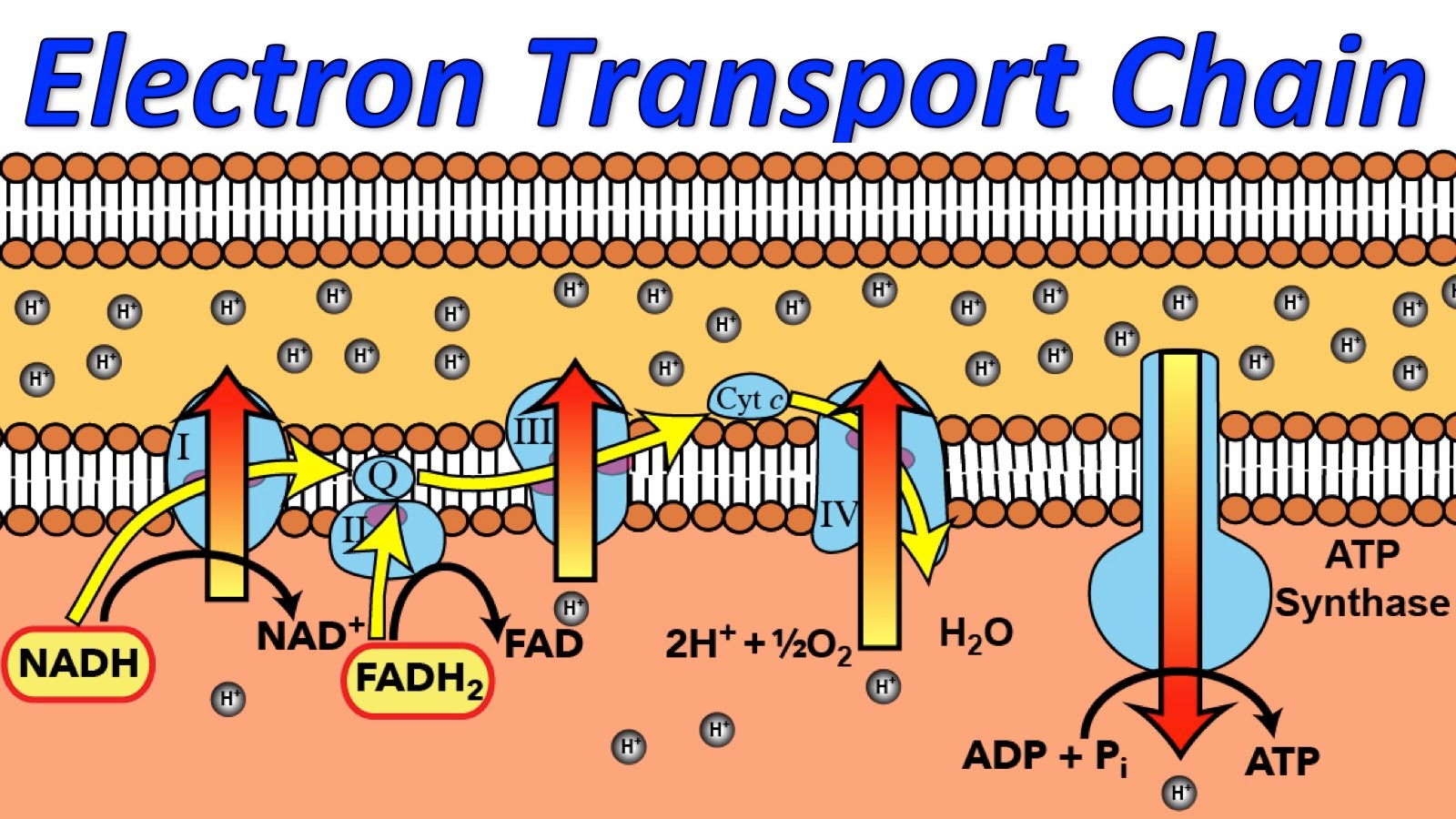
their e-’s

* After \_\_\_\_\_\_\_\_\_\_\_\_, **90%** of the energy is \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_in the 2 pyruvates
* \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_- when oxygen is present for a reaction
* **O2 is** and is needed to complete \_\_\_\_\_\_\_\_\_\_ cellular respiration and \_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_

**possible!!**

* **It occurs in the \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_**
* **Makes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Step 3 in the presence of oxygen - \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ (ETC)**

**\_\_\_\_\_\_\_\_\_\_\_ are shuffled through the electron transport chain with the \_\_\_\_\_\_ of \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ molecules, such as NADH.**

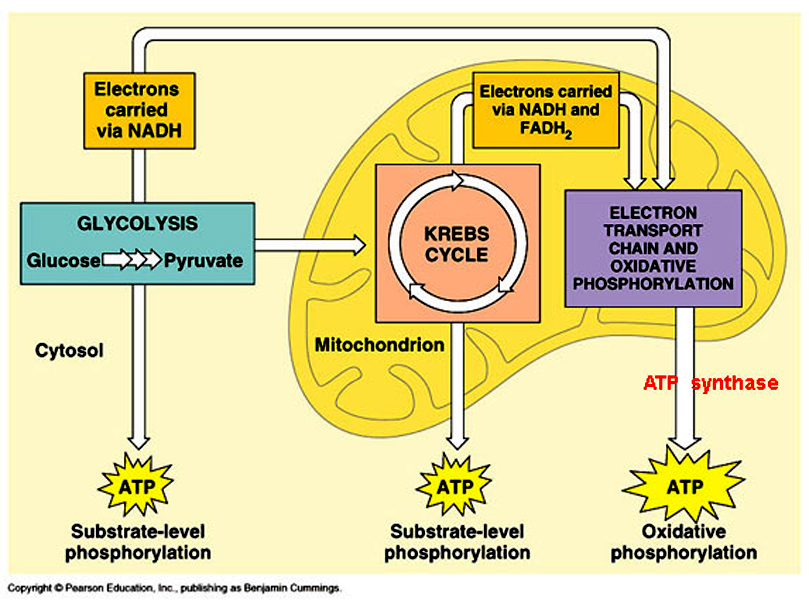
* **The electron transport chain makes \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_.**

**An Overview**:

* Takes place in the inner \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Electrons carried by high \_\_\_\_\_\_\_\_\_ molecules (NADH and FADH2) are passed to **protein carriers in**

**the** \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_.

* As electrons are passed down the chain, the \_\_\_\_\_\_\_\_\_\_\_ **from the e-’s** allows the **proteins to pull**

**H+’s across the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_** to the **inter-membrane space.**

**A summary of Aerobic Cellular Respiration (use the diagram to the right to assist you with your summary):**