**Topic 5: Cellular Energy (Photosynthesis and Respiration)**

**Photosynthesis**

Plants:

* Autotrophs – they make their own sugars during photosynthesis = Producers - Produce food for all other organisms

Animals:

* Heterotrophs – must get their sugars (carbohydrates) for energy from other sources = Consumers – Consume the food provided by plants

Sun

Ultimate source of energy because it provides the energy for the plants which is then passed down to other organisms

Photosynthesis

* The process by which plants convert the sun’s energy, water and carbon dioxide to sugar and oxygen (a by-product)
* Takes place in the chloroplasts
* Chlorophyll is the molecule that receives the sun’s energy
* Chloroplasts are in the mesophyll cells of the leaves and stems (green parts) just below the surface of the leaf (or stem)

There are two major reactions in photosynthesis

1. Light Dependent reactions
	1. Aka Light Reactions
	2. Aka photolysis
	3. Light energy is absorbed by chlorophyll, which uses the energy to split water. Oxygen is released to the outside of the cell, the “H” part of H2O is carried to the dark reactions with NADP**H**
	4. Some ATP (energy) is made here—will be used up in Light Independent reactions
2. Light Independent reactions
	1. Aka Dark Reactions
	2. Aka Carbon fixation (Calvin Cycle)
	3. CO2 from the outside is combined with the “H” part of NADP**H**  to make sugars for the cell
		1. NADP+goes back to light dependent reactions
	4. ATP is used to combine the CO2 and H
		1. ADP goes back to light dependent reactions

**Respiration**

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| Cellular respiration occurs in the mitochondria of eukaryotic organisms. It is composed of three major steps1. Glycolysis -- glucose is split into 2 3-carbon compounds and a small amount of energy is released.
	1. Cytoplasm of all cells
2. Kreb’s cycle – takes 3-carbon compounds and breaks them down into carbon dioxide
	1. Inner part of mitochondria (matrix)
3. Electron transport chain – takes electron carriers and materials to create a concentration gradient that ultimately creates ATP
	1. Inner folds of mitochondria (cristae)
* **Respiration** - I. Breathing [external respiration]; II. oxidative metabolism in which an inorganic substance, usually oxygen, is used as the final electron [hydrogen] acceptor; compare with fermentation.
* **Glycolysis** - Metabolic pathway found in the cytoplasm that participates in aerobic cellular respiration and fermentation; it converts glucose to two molecules of pyruvate.
* **Glucose** - Six-carbon sugar that organisms degrade as a source of energy during cellular respiration.
* **Energy** - Capacity to do work and bring about change; occurs in a variety of forms.
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In the absence of oxygen, some organisms will use the products of glycolysis and go through fermentation.

1. Alcoholic fermentation—makes alcohol and CO2 as the byproducts. Creates no ATP, but “refreshes” carriers so glycolysis can continue
2. Lactic acid fermentation—makes lactic acid as the byproduct. Creates no ATP, but “refreshes” carriers so glycolysis can continue