**Chapter 4: Photosynthesis & Cellular Respiration “Notes in a Nutshell’**

**Photosynthesis**

 -most important biological cycle on Earth

-process by which plants take sunlight, CO2 and water to create food for themselves and all other living things

-Plants are the ONLY thing that can do this conversion (autotrophs)

 -phototrophs (use light to make food)

 -chemotrophs (use chemicals to make food)

**Steps of Photosynthesis**

 -Light reactions (PSII & PSI)

 -Chemiosmosis

 -Hydrolysis

 -Calvin Cycle

**STEP 1: The Light Reactions**

 -green pigment (chlorophyll) is found inside the thylakoids of the Chloroplast

in a plant cell

 -sunlight strikes PSII and this extra energy is absorbed by atoms of

chlorophyll until an electron becomes so excited it ‘escapes’ from its orbit

 -the superexcited electron is captured by a Primary Electron Acceptor before

it can escape the thylakoid & is sent down an electron transport chain where

it replaces a missing electron in PSI

 -at the same time sunlight strikes PSI and this extra energy is absorbed by

atoms of chlorophyll until an electron becomes so excited it ‘escapes’ from its

orbit

 -the superexcited electron is captured by a Primary Electron Acceptor before

it can escape the thylakoid & is sent down a second electron transport chain

where it joins with H+ to form NADPH (a cheap form of energy)

**Chemiosmosis**

 -This is the production of ATP – the most important form of energy for ALL

cells

 -this occurs in the Thylakoid membrane

**Hydrolysis**

 -Water is used by the plant for its parts – much like you would sell a junk car

for parts, the plant tears apart water molecules to have access to the Hydrogen and Oxygen

-water is broken down into Hydrogen ions (H+), used to join with the electron at the end of the second electron transport chain in the Light reactions to form NADPH, electrons (used to replace the ones lost in PSII during the Light reactions) and Oxygen (released as a waste product)

**STEP 2: The Calvin Cycle**

 **This is a CARBON FIXATION CYCLE – meaning it takes Carbon from one source (CO2) and attaches it to a more important molecule for life on Earth, CARBOhydrates.**

 -This occurs OUTSIDE the thylakoid membrane, but still INSIDE the chloroplast

 -3CO2 enter the Calvin Cycle along with 9 ATP, 6NADPH (15 units of energy) to make 1 carbohydrate – this is a very energy expensive process for the plant!

**ENVIRONMENTAL FACTORS**

-if any of the three key ingredients change in availability, the speed of photosynthesis will be adjusted accordingly:

More CO2 = faster Photosynthesis

 Less CO2 = slower Photosynthesis

More water = faster Photosynthesis

 Less water = slower Photosynthesis

More sunlight = faster Photosynthesis

Less sunlight = slower Photosynthesis

**CELLULAR RESPIRATION**

**ALL living things must undergo Cellular Respiration in order to use their food – EVEN PLANTS!!**

 -This is the metabolism of the 7 Characteristics of Life learned in Chapter 1

**Steps of Cellular Respiration**

 -1. Glycolysis

 -2. Respiration (2 types)

 a. Aerobic (with Oxygen present)

 b. Anaerobic (NO Oxygen present)

**Glycolysis**

-2 carbs from photosynthesis enter the cell & are immediately broken down into Pyruvic Acid

 -happens in the cytoplasm of the cell

 -releases 2 ATP in the process

**AEROBIC respiration (Oxygen IS present)**

 -this is the preferred method of CR for most living things on earth

 -takes place inside the mitochondria organelle

 -Pruvic Acid is converted to Acetyl Co-A

 -Acetyl Co-A enter the Krebs Cycle where ATP is produced in large amounts

-extra electrons are passed through an electron transport chain where at the end it attaches to oxygen and hydrogen to make water – which is released as a waste product along with CO2

**ANAEROBIC respiration (LACTIC ACID FERMENTATION)**

-when there is not enough Oxygen present you body will go into emergency mode in order to keep your cells alive until Oxygen is available again

-Pyruvic Acid is converted into Lactic Acid – this causes us pain when it builds up

 -the liver converts it back to Pyruvic Acid

**ANAEROBIC respiration (ALCOHOLIC FERMENTATION)**

 -only done by yeast

 -pyruvic acid is converted to Ethyl Alcohol