**Photosynthesis Notes Name: Period:**

**Overview: The Process That Feeds All Living Things**

**Photosynthesis** (photo = light, synthesis = to make, put together)

* Overall Definition: the process that converts \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (photons) into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (glucose)
* Plants are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* They are the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an ecosystem.
	+ - Plants use energy from the sun to produce the food that feeds the ecosystem
		- Some bacteria (ex. blue-green algae) and some protists are also photosynthetic

**Chemosynthesis**

* Certain types of bacteria and fungi use energy from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (such as hydrogen sulfide) instead of light energy to produce food.
* This process is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**Leaf Anatomy**

**Photosynthesis Occurs Within the Cells of Plant Leaves**

* Nutrients and water, can get into and out of leaves:
	+ \_\_\_\_\_\_\_\_\_\_\_\_: Carries \_\_\_\_\_\_\_\_\_ and dissolved \_\_\_\_\_\_\_\_\_\_\_\_ upward from roots into the stems and leaves
	+ \_\_\_\_\_\_\_\_\_\_: Transports \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (ex. sugars) from where they are made to where they are needed
	+ \_\_\_\_\_\_\_\_\_\_ (singular): allows \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_(transpiration) to enter and leave the leaves. Plural = \_\_\_\_\_\_\_\_\_\_\_\_
* Photosynthesis converts light energy to the chemical energy of food
	+ The leaves of plants are the sites of photosynthesis

**Chloroplasts: The Sites of Photosynthesis**

* The organelles in which photosynthesis occurs
* Contain **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, grana, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ - \_\_\_\_\_\_\_\_\_\_\_\_\_\_= disk-shaped sac in the stroma of a chloroplast
		- \_\_\_\_\_\_\_\_\_\_ = layers or stacks of thylakoids
		- \_\_\_\_\_\_\_\_\_\_ = the thick fluid contained in the inner membrane of a chloroplast; made of water and enzymes
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** The Green Pigment Inside Chloroplasts
	+ - Chlorophyll is a pigment.
		- A pigment is any substance that absorbs light.
		- The color of the pigment comes from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (in other words, those not absorbed).
		- Chlorophyll is green because it reflects green light.

**The Chemical Reaction of Photosynthesis**

* Photosynthesis is summarized by the following chemical reaction:



**The Balanced Chemical Equation:**

 \_\_CO2 + \_\_H2O + Light Energy → C6H12O6 + \_\_O2

* Chloroplasts split carbon dioxide and water
	+ To make sugar molecules, oxygen, and water
	+ The\_\_\_\_\_\_\_\_\_\_\_\_\_ we breath comes from **\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ The **\_\_\_\_\_\_\_\_\_\_\_**in our food, comes from **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Adenosine Triphosphate (ATP)**

* ATP is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ source for cell processes
* Energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when ATP is converted to ADP (Adenosine Diphosphate)
	+ Tri = \_\_\_\_\_\_ Di = \_\_\_\_\_\_\_\_\_\_\_
* ADP can be converted into ATP again using energy from food to reform bonds.
* ATP is made of three components
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**The Two Stages of Photosynthesis**

* Photosynthesis consists of two processes
	+ The light (dependent) reactions
	+ The dark (light-independent) reactions; also called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cycle

**The Light Reactions**

* Occur in the \_\_\_\_\_\_\_\_\_
	+ Split \_\_\_\_\_\_\_\_\_
	+ Release \_\_\_\_\_\_\_\_\_\_\_\_
	+ Produces \_\_\_\_\_\_\_\_\_ (energy)
	+ Produces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(carries H+ from the light reactions to the Calvin cycle)

**The Calvin Cycle (Light Independent Reactions)**

* Occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Forms \_\_\_\_\_\_\_\_\_\_\_\_\_ from carbon dioxide
	+ Uses \_\_\_\_\_\_\_\_\_\_\_ for energy
	+ Also uses \_\_\_\_\_\_\_\_\_\_\_\_

**Putting the two reactions together**

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**Summary of Photosynthesis**

* **The overall chemical equation:**

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**\_\_CO2 + \_\_H2O + Light Energy → C6H12O6 + \_\_O2**

|  |  |  |
| --- | --- | --- |
|  | **Light Reactions** | **Calvin Cycle** |
| **Takes place in the….** |  |  |
| **Reactants are….** |  |  |
| **Products are….** |  |  |

**The Nature of Sunlight**

* Light reactions convert \_\_\_\_\_\_\_\_\_\_\_ energy to the \_\_\_\_\_\_\_\_\_\_\_\_energy stored in the \_\_\_\_\_\_\_\_ of glucose molecules.
* Sunlight is a form of electromagnetic energy, which travels in waves

**The visible light spectrum**

* Includes the colors of light we can see
* Includes the wavelengths (colors of light) that power photosynthesis

**Pigments**

* Substances that \_\_\_\_\_\_\_\_\_\_\_\_\_ visible light AND \_\_\_\_\_\_\_\_\_ light, which include the colors we see\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the most abundant pigment in plants.

**The absorption spectra of chloroplast pigments**

* Provide clues to the relative effectiveness of different wavelengths for driving photosynthesis
* Green has the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ absorption and the most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ making plants appear green