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

**\*Note: Vocab words are in BOLD throughout the reading**

**PHOTOSYNTHESIS -PART I: THE SUN AND LIGHT**

Not all of the light from the sun makes it to the surface of the Earth. Even the light that does make it here is reflected and spread out. The little light that does make it here is enough for the plants of the world to survive and go through the process of***photosynthesis***. Light is actually energy. When that energy gets to a green plant, all sorts of reactions can take place to store energy in the form of sugar molecules.
1. What kind of energy is needed for photosynthesis to occur?

2. What kind of energy is produced during photosynthesis?

Remember we said that not all the energy from the Sun makes it to plants? Even when light gets to a plant, the plant doesn't use all of it. It actually uses only certain colors to make photosynthesis happen. Plants mostly absorb red and blue wavelengths. When you see a color, it is actually a color that the object does NOT absorb. In the case of green plants, they do not absorb light from the green range.

3. Explain why most plants look green.

**PART II: THE CHLOROPLAST**

We already spoke about the structure of***chloroplasts*** during our cell unit. We want to reinforce that photosynthesis happens in the chloroplast. Within this cell organelle is the ***chlorophyll*** that captures the light from the Sun. We'll talk about it in a bit, but the chloroplasts are working night and day with different jobs. The molecules are moved and converted in the area called the **stroma**.

4. What chemical reaction occurs in the chloroplast?

5. Do animals have chloroplasts? \_\_\_\_\_\_\_\_\_\_\_\_

6. Can animals photosynthesize? \_\_\_\_\_\_\_\_\_\_\_

7. What is the role of the chlorophyll?

**PART III: THE MOLECULES**

***Chlorophyll*** is the magic compound that can “grab” that sunlight and start the whole process. Chlorophyll is actually quite a varied compound. There are four (4) types: a, b, c, and d. Chlorophyll can also be found in many microorganisms and even some prokaryotic cells.

8. Structures determine functions….. Do you think the microorganisms and prokaryotes that have chlorophyll can do photosynthesis? \_\_\_\_\_\_\_\_\_\_\_ Why or why not?

However, as far as plants are concerned, the chlorophyll is found in the chloroplasts. The other big molecules are water (H2O), carbon dioxide (CO2), oxygen (O2) and glucose (C6H12O6).

9. List the most important compounds in photosynthesis.

That glucose is used in various forms by every creature on the planet. Animal cells require oxygen to survive. Animal cells need an aerobic environment (one with oxygen).

10. Animals need the products of photosynthesis to survive. What are these products?

*For our multiple intelligences: here are three different ways to visualize the photosynthesis reaction:*

|  |  |  |
| --- | --- | --- |
| Photosynthesis in pictures | Photosynthesis in words | Photosynthesis in symbols |
| Super basic process of photosynthesis | Carbon dioxide and water combine with light to create oxygen and glucose.  |  lightCO + H2O → C6H12O6 + O2 |

11. Is it easier for you to visualize the reaction by using pictures, words, or symbols (see above)?

12. What are the reactants of photosynthesis? (what begins the reaction)

13. What are the products of photosynthesis? (what is formed)

14. What is the catalyst for photosynthesis? (what helps the reaction occur)

15. What questions do you have so far?

***Mitochondria - Turning on the Powerhouse***

***Mitochondria*** are known as the powerhouses of the cell. They are **organelles** that act like a digestive system that takes in nutrients, breaks them down, and creates energy for the cell. The process of creating cell energy is known as ***cellular******respiration*.** Most of the chemical reactions involved in cellular respiration happen in the mitochondria. A mitochondrion is shaped perfectly to maximize its efforts.
1. What process happens in the mitochondria?

2. What is the purpose of the process in #1 (what does it create)?

Mitochondria are very small organelles. You might find cells with several thousand mitochondria. The number depends on what the cell needs to do. If the purpose of the cell is to transmit nerve impulses, there will be fewer mitochondria than in a muscle cell that needs loads of energy. If the cell feels it is not getting enough energy to survive, more mitochondria can be created. Sometimes they can even grow, move, and combine with other mitochondria, depending on the cell's needs.

3. Mitochondria produce energy. What kinds of cells need lots of energy?

***Introduction to Cellular Respiration***

Organisms, such as plants, can trap the energy in sunlight through photosynthesis and store it in the chemical bonds of carbohydrate molecules. The principal carbohydrate formed through photosynthesis is ***glucose***. Other types of organisms, such as animals, fungi, protozoa, and a large portion of the bacteria, are unable to perform this process. Therefore, these organisms must rely on the carbohydrates formed in plants to obtain the energy necessary for their metabolic processes.

4. Some organisms perform photosynthesis to produce energy. Other organisms cannot do photosynthesis. What can they do in order to generate energy?

Animals and other organisms obtain the energy available in carbohydrates through the process of ***cellular respiration***.

5. What is the purpose of cellular respiration?

Cells take the carbohydrates into their cytoplasm, and through a complex series of metabolic processes, they break down the carbohydrates and release the energy.

6. What happens to carbohydrates during cellular respiration?

The energy is generally not needed immediately; rather it is used to combine adenosine diphosphate (ADP) with phosphate ions to form adenosine triphosphate (ATP) molecules. The ***ATP*** can then be used for processes in the cells that require energy, much as a battery powers a mechanical device.

7. What is the chemical energy in the cell called?

 8. What does ATP stand for?

During the process of cellular respiration, carbon dioxide is given off. This carbon dioxide can be used by plant cells during photosynthesis to form new carbohydrates.

9. What is one product of cellular respiration?

10. How do animals get rid of the carbon dioxide? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What body system is involved with removing this waste? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Also in the process of cellular respiration, oxygen gas is required to serve as an acceptor of electrons. This oxygen is identical to the oxygen gas given off during photosynthesis.

11. (Circle one) Oxygen is a PRODUCT OR REACTANT of respiration? (In other words, is it needed or released?)

|  |  |  |
| --- | --- | --- |
| **Energy-producing process** | **Reaction** | **Location in cell** |
| **Photosynthesis** | **12. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **Chloroplast** |
| **Cellular respiration** | http://media.wiley.com/Lux/44/8544.nce001.jpg | **13. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

14. Look at the reactions for photosynthesis and respiration. What is the relationship between the two?

--------------------------------------------------------------------------------------------------------------------------------------------------------------**HUMANS AND PLANTS**

Humans need plants. All animals do. Humanity's relationship with plants has actually made it possible for us to have a civilization. Before we had cities, humans went around in little packs and were hunter-gatherers. We ate rats, birds, berries, and whatever food we could find. It wasn't very efficient. One day someone had the bright idea to plant the plants we like to eat. When humans did that, they were able to stay in one place full time. Then came the cities and a huge system of agriculture to support millions of people.

**BIG TIME FARMING**

As time has passed, we have taken farming to new levels. We have manipulated species to create big apples and large ears of corn. The plants would never have done it in the wild. It took man to change the plants. We are also moving toward the **genetic alteration** of plants. We're trying to make plants that are resistant to disease and bugs. These stronger plants will allow our crops to give us more food from the same amount of space.

1. Genetic alteration probably refers to altering what…. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (found in the nucleus)

**Vocabulary**

**(this will be included in the vocabulary section of your binder after you receive a grade)**

**Directions: Use the reading, textbooks, and/or dictionaries to define the following words.**

**Helpful prefixes:**

Photo: light

Chloro: color

|  |  |  |  |
| --- | --- | --- | --- |
| **Vocabulary Word** | **Reminds me of…****OR Sounds like….** | **Picture** | **Definition** |
| **Chloroplast** |  |  |  |
| **Chlorophyll** |  |  |  |
| **Photosynthesis** |  |  |  |
| **Glucose** |  |  |  |
| **Mitochondria** |  |  |  |
| **Cellular respiration** |  |  |  |
| **ATP** |  |  |  |
| (Add a word here)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |