

Advisement Teacher & Room # _____

Biology

Student Name _____ Tutor: _____

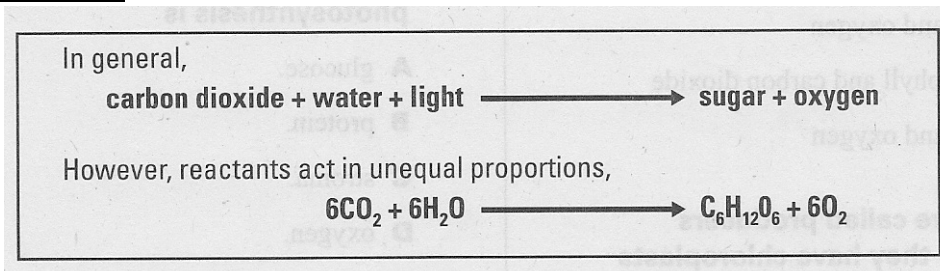
Tutorial

#8 and #9

Biology Teacher's Name _____ Period _____

CA State Standard 1f - Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide. 1g - Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.

Photosynthesis is a process that uses energy absorbed from visible light to produce carbohydrate molecules, or sugars. The process requires water and carbon dioxide (CO₂), and it releases oxygen (O₂) as it forms sugars that store chemical energy. Plants, some bacteria, and some protists can carry out photosynthesis. Photosynthesis allows these organisms to meet their energy needs by making their own food.



In plants photosynthesis takes place in **chloroplasts**, shown in the diagram. Chloroplasts contain membrane-bound compartments called **thylakoids**. The stroma is the fluid inside a chloroplast, but outside of the stacks of thylakoids, called grana. Parts of photosynthesis take place in the stroma, and parts in the thylakoids, which contain chlorophyll. Chlorophyll is the main light-absorbing pigment in chloroplasts,

Photosynthesis has two stages.

The first is a series of **light-Dependent reactions**, which capture some of the energy in sunlight. In these reactions, light energy is absorbed by chlorophyll, and then transferred along the **thylakoid membrane**. Water is also broken down into hydrogen ions, electrons, and O₂. The hydrogen ions are used to drive adenosine triphosphate (ATP) production. Energy from electrons is used in the transport of hydrogen ions, and electrons are eventually transferred to a molecule called NADP to make a molecule called NADPH. NADPH is a molecule that, along with ATP, transfers energy to the second stage of photosynthesis.

The second stage is a series of reactions that **occur in the stroma** and can take place without light. These are the **light-Independent reactions**, which include the **Calvin cycle**. These reactions use energy from the ATP and NADPH produced during the light-dependent reactions and CO₂ from the atmosphere. Through the chemical reactions of the Calvin cycle, sugars are built.

Overall, the process of photosynthesis uses six molecules of CO₂ and six molecules of water in combination with light to produce six molecules of O₂ and one simple sugar, such as glucose.

Complete the questions that follow:

1. Describe the structure of a chloroplast:
2. What are the products of photosynthesis?
3. Where do light-Dependent reactions take place?
4. Where do light-Independent reactions take place?
5. For which stage of photosynthesis is Water necessary?
6. For which stage of photosynthesis is CO₂ necessary?