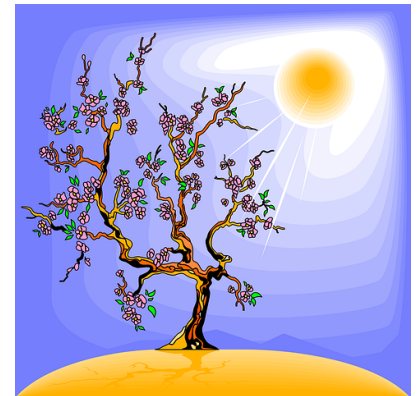


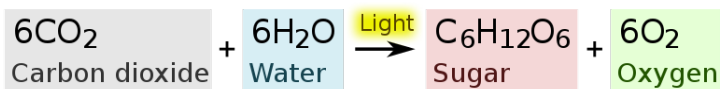
Photosynthesis Guided Notes – Student Edition

What is photosynthesis?

Most life on Earth depends on photosynthesis. The process is carried out by plants, algae, and some types of bacteria, which _____ energy from sunlight to produce oxygen (O₂) and _____ stored in glucose (a sugar). Herbivores then obtain this energy by eating _____, and carnivores obtain it by eating _____.



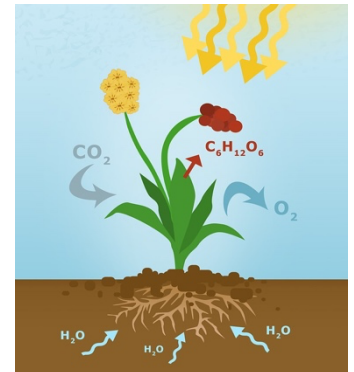
The process can be summarized as:



_____, the main product of photosynthesis, is a sugar that acts as the "food" source for plants. The glucose is then converted into usable chemical energy, _____, during cellular respiration. The _____ formed during photosynthesis, which is necessary for animal life, is essentially a _____ product of the photosynthesis process.

Reactants and Products in Photosynthesis

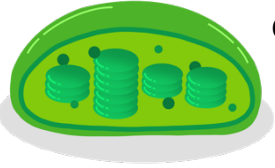
During photosynthesis, plants take in _____ (_____) and _____ (_____) from the air and soil. These are the _____ in photosynthesis. Within the plant cell, the water is _____, meaning it loses electrons, while the carbon dioxide is _____, meaning it gains electrons. This transforms the water into _____ (_____) and the carbon dioxide into _____ (_____).



The plant then _____ the oxygen back into the air, and _____ energy within the glucose molecules. Thus, oxygen and glucose are the _____ of photosynthesis. These two products of photosynthesis are the _____ of cellular respiration. Glucose is _____ at the initial stage of cellular respiration and its simpler form _____ with oxygen, in order to _____ ATP.

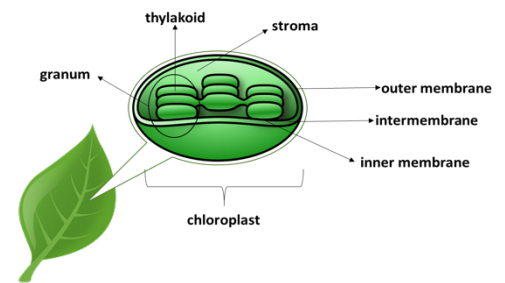
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Structure of Chloroplasts



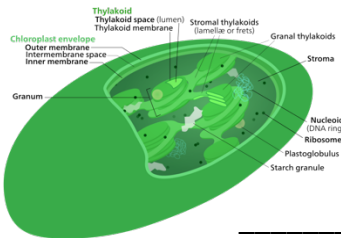
Chloroplasts are found in all _____ plants and algae. They are the _____ of plants. These are found in _____ located in the leaves of the plants. Chloroplast has its own extra-nuclear DNA and therefore are _____, like mitochondria. They also produce _____ and _____ required for the production of chloroplast membrane.

Chloroplast contains a high concentration of _____ that traps sunlight. This cell organelle is _____ present in animal cells. It is _____ or _____, with a size that usually varies between 4-6 μm in diameter and 1-3 μm in thickness. They are double-membrane organelle with the presence of _____, _____ and _____ space.



There are two distinct regions present inside a chloroplast known as the _____ (*si.* _____) and _____. Grana are made up of stacks of disc-shaped structures known as _____. The grana of the chloroplast consists of chlorophyll pigments and are the _____ of chloroplasts.

Stroma is the homogenous matrix which contains grana and is similar to the _____ in cells in which all the organelles are embedded. Stroma also contains various _____, DNA, ribosomes, and other substances. _____ function by connecting the stacks of thylakoid sacs or grana.



Thylakoids have a relatively simple structure. The outside of the thylakoid is called the _____, which is a thin covering that keeps harmful things out while allowing necessary things, like nutrients, in. Thylakoid membranes act as the _____ for chlorophyll and other photosynthetic pigments. The membrane surrounds the region called the _____, which is an aqueous substance that contains components necessary for the process known as _____.

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Stages in Photosynthesis

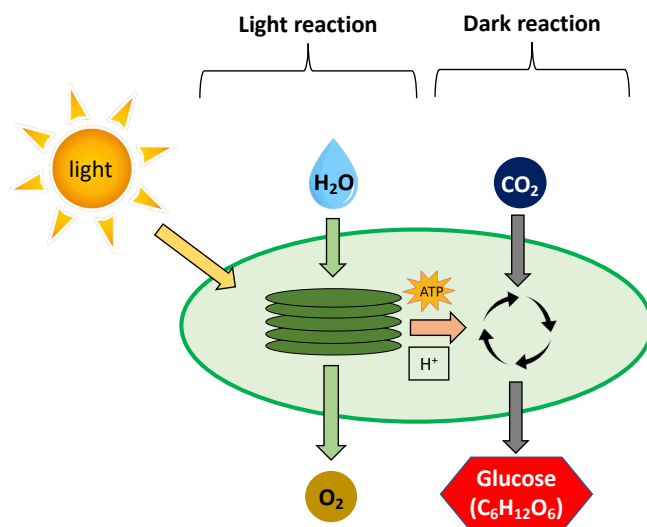
While there are many steps behind the process of photosynthesis, it can be broken down into two major stages: _____ reactions and _____ reactions.

The light-dependent reaction takes place within the _____ and requires a _____ of sunlight, hence the name light-dependent reaction. The chlorophyll absorbs energy from the light waves, which is converted into chemical energy in the form of the molecules _____ and _____. These molecules are generated by two _____ and are also used in the second stage of photosynthesis. During the light reactions, _____ is used and _____ is produced. These reactions can only occur during daylight as the process needs sunlight to begin.

The light-independent stage, also known as the _____, takes place in the _____, the space between the thylakoid membranes and the chloroplast membranes. It _____ require light, hence the name light-independent reaction or _____ reaction. During this stage, energy from the ATP and NADPH molecules is used to assemble carbohydrate molecules, like glucose, from _____.

The Calvin cycle has two parts. First carbon dioxide is “_____”, then ATP and NADPH from the light reactions _____ to combine the fixed carbons to make sugar.

Like an electron transport chain, the Calvin cycle, transfers energy in _____, _____. Each step pushes molecules uphill in terms of energy content. Recall that in the electron transport chain, excited electrons lose energy to NADPH and ATP. In the Calvin cycle, NADPH and ATP formed in the light reactions _____ their stored chemical energy to build glucose.



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Comparison between Light and Dark Reactions

Light Reaction	Dark Reaction
It takes place only in the _____ of light.	It can take place in the _____ or _____ of sunlight.
It is a _____ phase.	It is a _____ phase.
It takes place in the _____ of the chloroplasts.	It takes place in the _____ of the chloroplasts.
The end products are _____ and _____.	_____ is the end product. ATP and NADPH _____ in the formation of glucose.
The water molecules split into _____ and _____.	Glucose is produced. _____ is utilized.

Importance of Photosynthesis

Photosynthetic organisms, including plants, algae, and some bacteria, play a key _____ role. They _____ chemical energy and fixed carbon into ecosystems by using light to synthesize sugars. Since these organisms produce their own food—that is, fix their own carbon—using light energy, they are called _____.



Humans, and other organisms that can't convert carbon dioxide to organic compounds themselves, are called _____. Heterotrophs must get fixed carbon by _____ other organisms or their by-products. Animals, fungi, and many prokaryotes and protists are heterotrophs. Therefore, through photosynthesis, plants are able to make their own food and provide food to other organisms, starting an _____ food chain.

Besides introducing fixed carbon and energy into ecosystems, photosynthesis also affects the makeup of _____. Most photosynthetic organisms generate _____ gas as a byproduct, and this gas is needed by organisms that use oxygen for cellular respiration. Moreover, through photosynthesis, the amount of carbon dioxide in the atmosphere is _____, thus, lessening the greenhouse effect which may result in _____.