



Objectives

- ✿ Differentiate between potential and kinetic energy.
- ✿ List the molecules and conditions required for photosynthesis to occur.
- ✿ Define the summary equation for photosynthesis.
- ✿ Describe the role of the Calvin Cycle.
- ✿ Evaluate the importance of photosynthesis to the world.



Energy

- ✿ Energy is the ability to do work and is required for life.
- ✿ **Autotrophs** are organisms that can create their own food by converting energy from the sun.
- ✿ **Heterotrophs** can not create their own food and must consume other organisms for their energy.

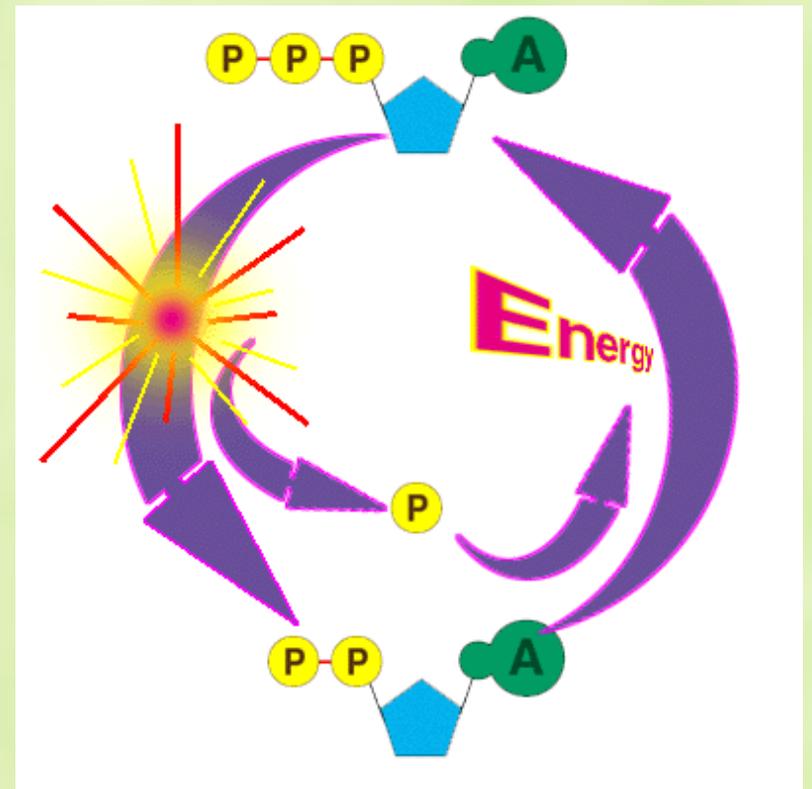


Forms of Energy

- ✿ **ATP (Adenosine triphosphate)** is the functional unit of energy for all living things.
- ✿ ATP stores energy so that an organism can access that energy when it is needed. This is **potential energy**.
- ✿ When energy is released it can be converted in to **kinetic energy** (movement) or **thermal energy** (heat.)

ATP

- ✿ ATP consists of adenosine and three (3) phosphate groups.
- ✿ When one phosphate group detaches, energy is released.
- ✿ The result is a free phosphate group and ADP (Adenosine diphosphate.)





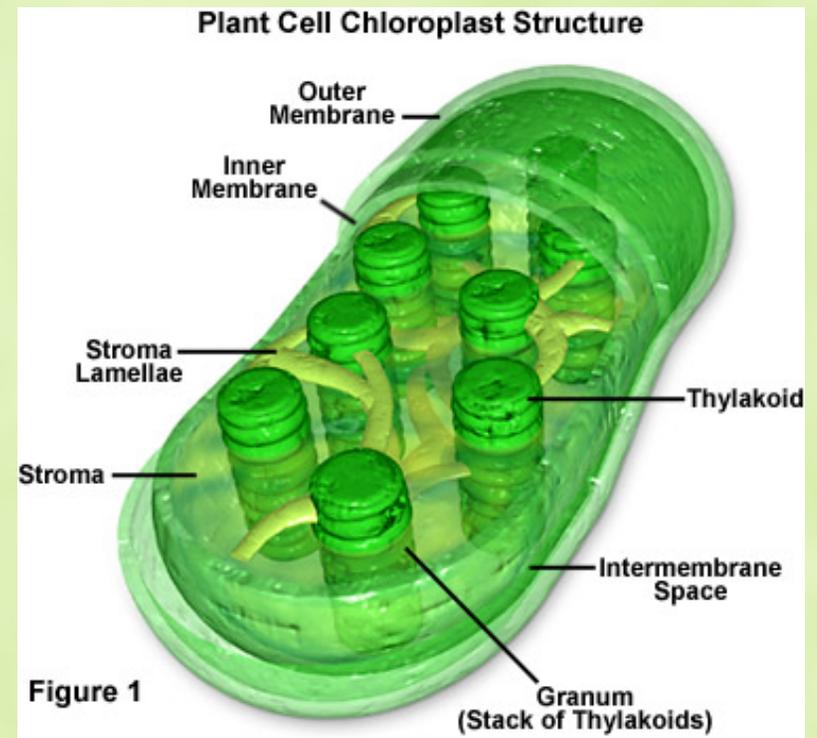
Photosynthesis

- ✿ In **Photosynthesis**, energy from the sun is stored in the phosphate bond of ATP in an organelle called a **chloroplast**.
- ✿ Chloroplasts contain a pigment called **chlorophyll** which absorbs certain wavelengths of light energy and reflects others (green).
- ✿ The general chemical equation for photosynthesis is:



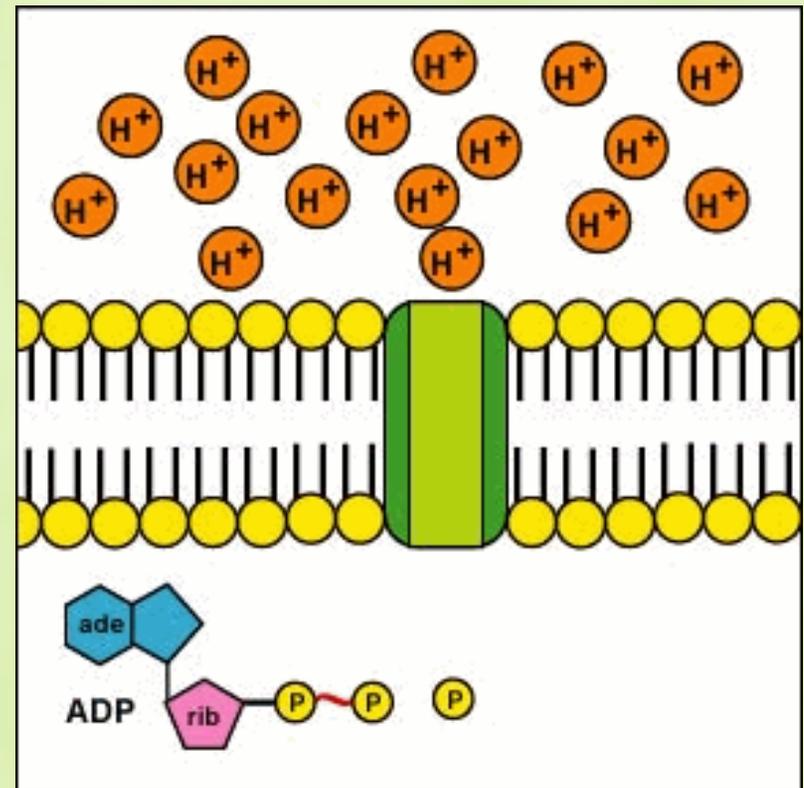
Inside the Chloroplasts

- ✿ The chloroplasts consists of small **thylakoids** which are stacked into **grana**.
- ✿ The thylakoids contain stacks of chlorophyll called **photosystems**.
- ✿ The area outside the thylakoid is called the **stroma**.
- ✿ The light absorbed by the chloroplast charges electrons that will create the bond in ATP.



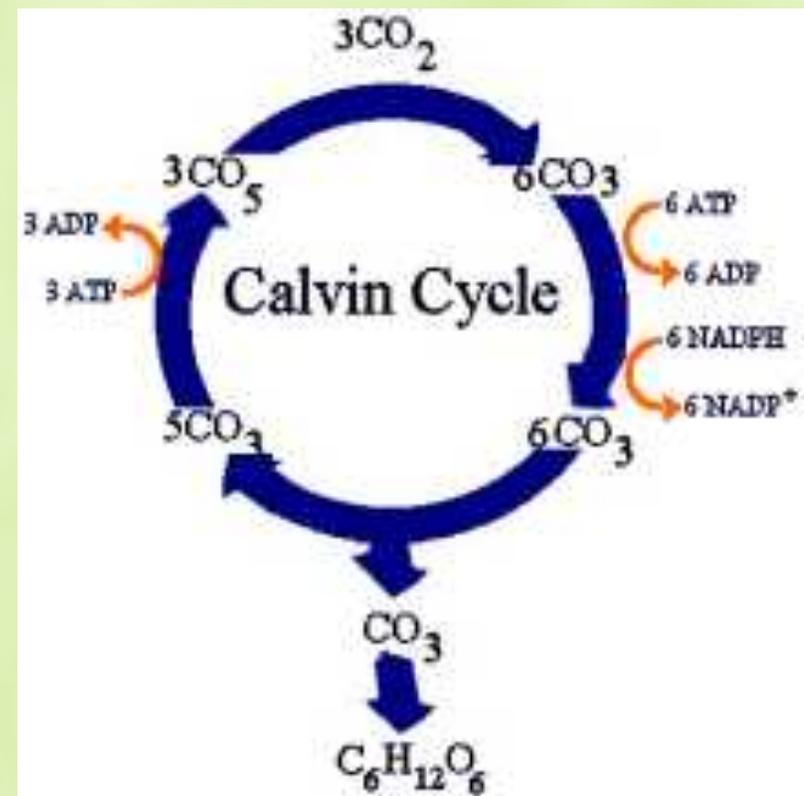
Photosynthesis (Cont...)

- ✿ Light enters the chloroplast and breaks apart the water molecule.
- ✿ The energy released is used to bond the 3rd phosphate group to an ADP molecule.



Calvin Cycle

- ✿ ATP is volatile so plants are able to take the energy and store in a more secure way.
- ✿ The ATP produced in the thylakoid enters the **Calvin cycle** along with carbon dioxide (CO_2) to store the energy into a complex molecule called **glucose**.
- ✿ This process can occur without light energy because is a conversion of previously stored energy.





The Importance of Photosynthesis

- ✿ Since animals (heterotrophs) can not produce their own food they depend on other organisms.
- ✿ Accordingly, all of the energy in the “food web” originates from plants (autotrophs.)
- ✿ This means that all of the energy we need comes indirectly from the sun.



The Importance of Photosynthesis (Cont...)

- ✿ Photosynthesis also has the benefit of producing oxygen, which we need for survival.
- ✿ More than 90% of the earth's oxygen is a result of photosynthesis.
- ✿ Photosynthesis can be affected by the lack of CO₂, the lack of light, the lack of water, or extreme temperatures (range: 0-35°C.)



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