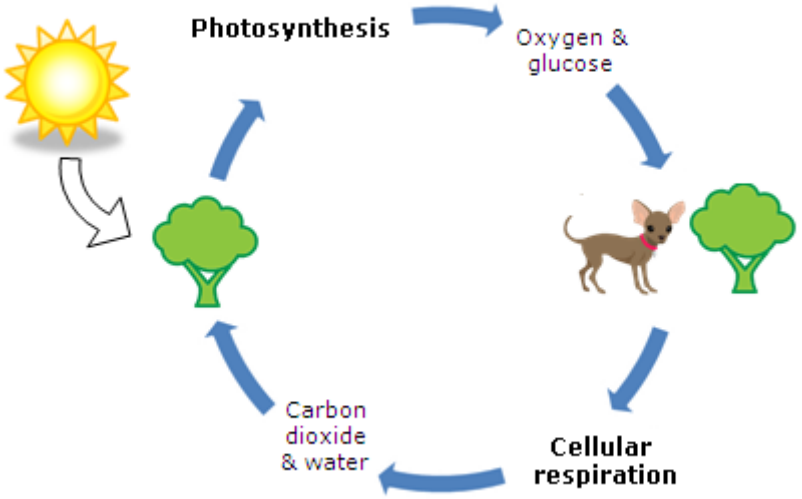
Photosynthesis & Respiration

*The processes of **photosynthesis** and **cellular respiration** are interdependent. That is, each process is necessary to fuel the other. So, the chemical products of photosynthesis are the chemical reactants of cellular respiration, and the products of cellular respiration are the reactants of photosynthesis.*

Interdependent Energy Processes

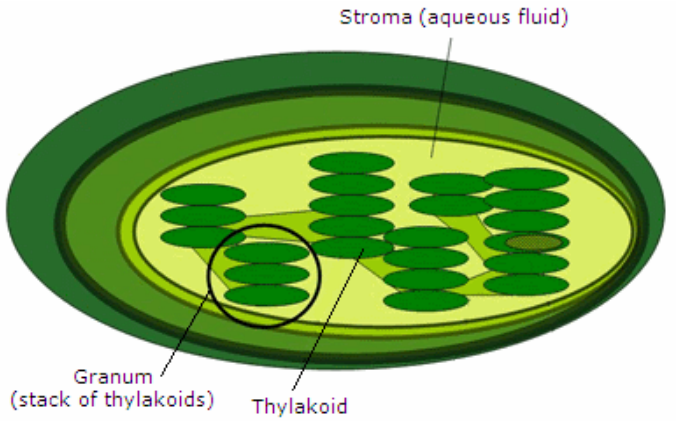
Energy is cycled through ecosystems by the processes of photosynthesis and respiration.



The processes of photosynthesis and cellular respiration are dependent on one another.

Photosynthesis

Photosynthesis occurs within the **chloroplast** of a cell.



Chloroplasts are cellular organelles that are shaped like flattened discs. They contain stroma and stacks of thylakoids, and they are the site of photosynthesis. Chloroplasts are found in the cells of plants and other eukaryotic, photosynthetic organisms.

During photosynthesis, plants and phytoplankton capture light energy from the Sun and use it to build *sugars* (chemical energy) out of *carbon dioxide* and *water*.

The process of photosynthesis can be generally expressed by the equation:

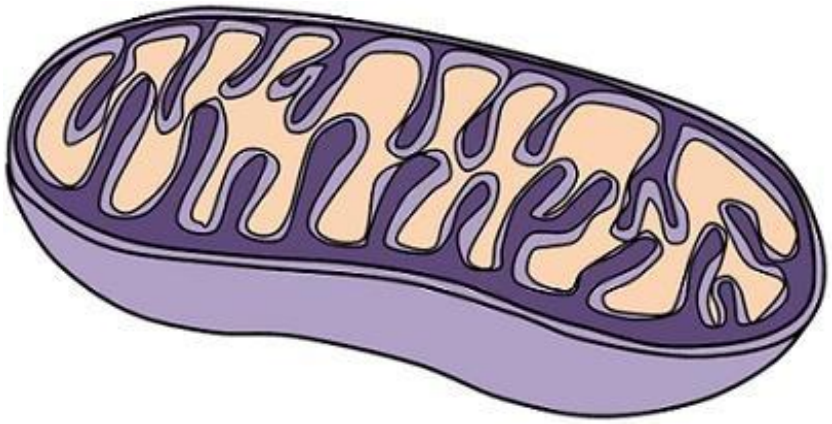
carbon dioxide + water + light energy → sugar + oxygen

The video below explains the process of photosynthesis. Click on the Play button to watch the video.

Clip provided by Education Clip Library with permission from ITN Source

Cellular Respiration

Cellular respiration occurs in the **mitochondrion** of a cell.



Mitochondria are found in both plant and animal cells. These organelles are rod-shaped with cristae and highly folded inner membranes.

Energy from the Sun is essentially stored in the chemical bonds of the sugar molecules in plants. Whenever organisms, including plants, need to use the energy stored in the bonds of these molecules, cells perform **cellular respiration**. During this process, cells take in *oxygen* in order to break the bonds of the plant *sugars* and produce *ATP*, *water*, and **carbon dioxide**.

Cellular energy is stored in the in the phosphate bonds of ATP molecules. Each time a phosphate group is removed from a molecule of ATP, energy is released. This energy can then be used to perform cellular work.

The process of cellular respiration can be generally expressed by the equation:

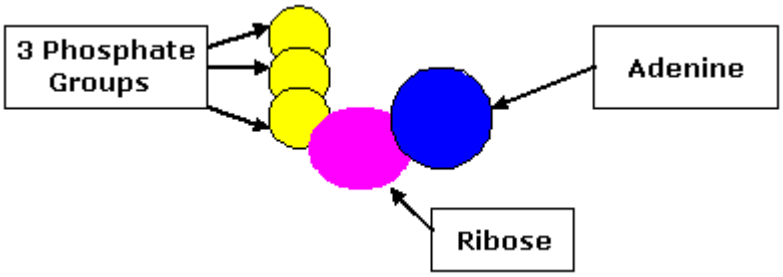
sugar + oxygen → carbon dioxide + water + ATP

Macromolecules & Cellular Energy

*Cells depend on specific types of macromolecules to store energy. These types of macromolecules include **ATP** and **lipids**.*

ATP

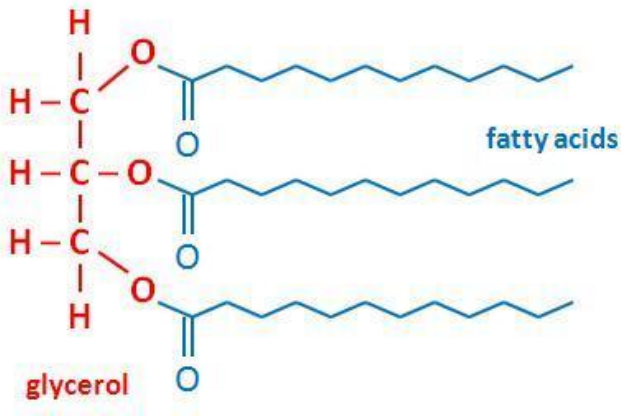
Adenosine triphosphate, or *ATP*, is a macromolecule used by the body for **energy storage**. ATP contains adenine, ribose, and three phosphate groups. Each of the phosphate bonds stores a large quantity of energy, which is released for use when the bond is broken. During metabolism, ATP is broken down to fuel chemical reactions. ATP can also be created by chemical reactions.



ATP contains adenine, ribose, and three phosphate groups and is used by cells for energy storage.

Lipids

Lipids are macromolecules used by the body for long-term energy storage. Lipids, like sugars, are composed primarily of carbon, hydrogen, and oxygen. They contain high-energy bonds that can be broken by cells to release energy to do cellular work.



Triglycerides are a type of lipid that contain one glycerol molecule and three fatty acids.