

## SOL LS.4 PHOTOSYNTHESIS &amp; CELLULAR RESPIRATION

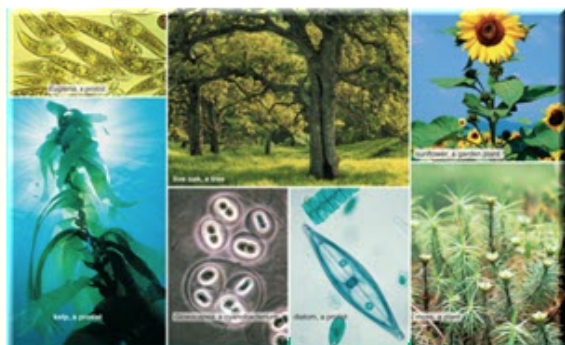
## LS.4 Photosynthesis

- photosynthesis is the foundation of virtually all food webs; and
- photosynthesis and cellular respiration support life processes.

Central Idea: Energy from the sun enters the food web through **photosynthesis** which produces sugar (glucose) and then is transferred through the food web. Animal and plant cells use glucose for energy through the process of **cellular respiration**.

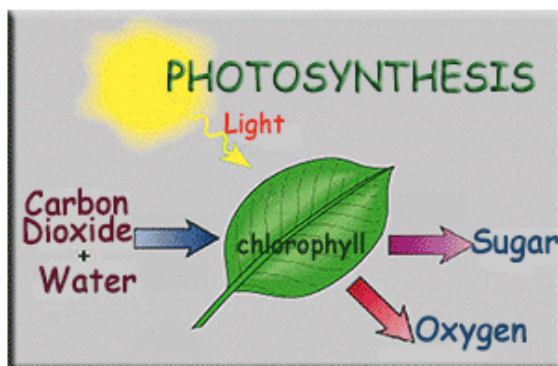
- Energy is continually transferred** from one object to another and transformed between various **forms**.
  - As **matter and energy flow** through different organizational levels of living systems, **chemical elements are recombined** to form different products.
  - The result of these chemical reactions is that **energy is transferred** from one system of interacting molecules to another.

## PHOTOSYNTHESIS

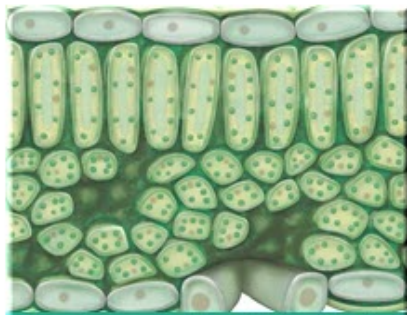


Photosynthesizing organisms include all plants, but also phytoplankton like algae and some bacteria

- Some organisms obtain energy for life processes by storing **energy from the sun in chemical bonds**. This process is called **photosynthesis**.
- Photosynthesizing organisms, including green plants, algae, and phytoplankton, produce their own food (sugar), and are called producers.**
- No process is more important for life on Earth than **photosynthesis**. **Producers** are the **foundation** of virtually all **food webs**.



- Sustaining **life** processes requires substantial **energy and matter inputs**.
- Two organelles—**chloroplasts** and **mitochondria**—act as change agents within the cells of living things to **make energy available** for life processes
- The organelles, cells, tissues, organs, and organ systems of plants work as a system to obtain the **raw materials (sunlight, water, and carbon dioxide)** and produce the **products (sugars and oxygen) in photosynthesis**



The chlorophyll in chloroplasts converts the sun's energy into the chemical energy in sugar (glucose)

**Chloroplasts**, organelles found in some plant cells, **convert radiant energy** from sunlight into chemical energy. Chloroplasts do this with the help of the pigment **chlorophyll**.

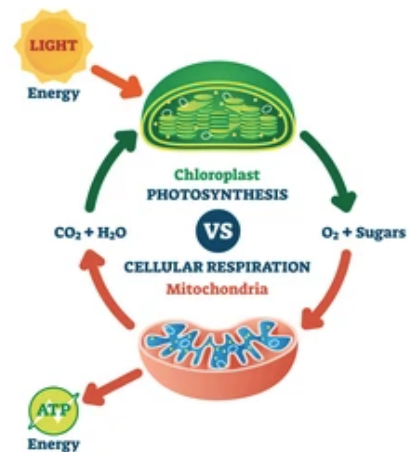
- **Chlorophyll** aids in the **energy transformation** of sunlight (radiant energy) to chemical energy in sugar
- The **sugar** molecules produced from photosynthesis can be **used immediately** by plants and animals for energy, **stored** for later use, or **rearranged into other compounds** to carry out **life processes**

## CELLULAR RESPIRATION

- **Cellular respiration** occurs in the **mitochondria** of all

**cells** (including plant cells).

- In this process, **sugar molecules** combine with **oxygen** to release energy in a form that cells can more easily use
- Although they occur in different organelles, **photosynthesis and cellular respiration** are **interdependent** processes.
  - The **products** of one process are the **reactants** for the other process and vice versa
- **Matter and energy** are **conserved** in chemical processes. This is true of all biological systems, from individual cells to ecosystems
- Living things are composed of systems which are dynamic and change in response to inputs and outflows of energy and matter.
- The **availability of raw materials** and other factors can affect the life processes of living things, including the rate of photosynthesis and cellular respiration.
  - Factors affecting the **rate of photosynthesis** are **light** intensity, **carbon dioxide** concentration, and **temperature**.
- **Cellular respiration** also releases the energy needed to **maintain body temperature**, despite ongoing energy loss to the surrounding environment.



**Photosynthesis & Cellular Respiration** work together to make the sun's energy available for life processes

### Students should :

- understand the role of photosynthesis in the **cycling of matter and flow of energy** into and out of organisms.
- understand why **producers** are the **foundation of food webs**
- know the **raw materials (reactants)** used and **products** generated in photosynthesis and cellular respiration
- the **cellular organelles** involved in **photosynthesis and cellular respiration**
- how **energy** from photosynthesis is used
- explain how **cellular respiration** is the reverse of **photosynthesis**