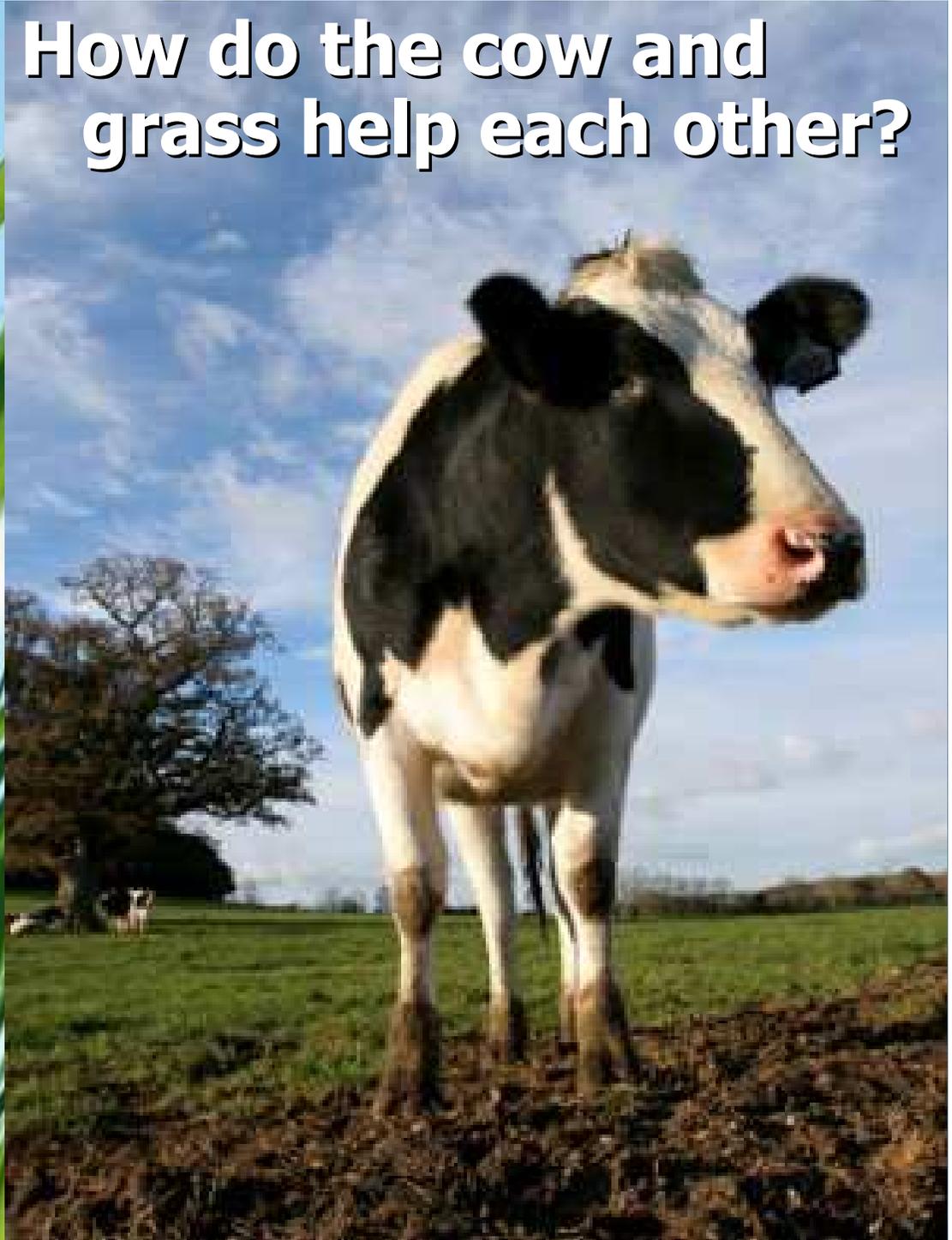
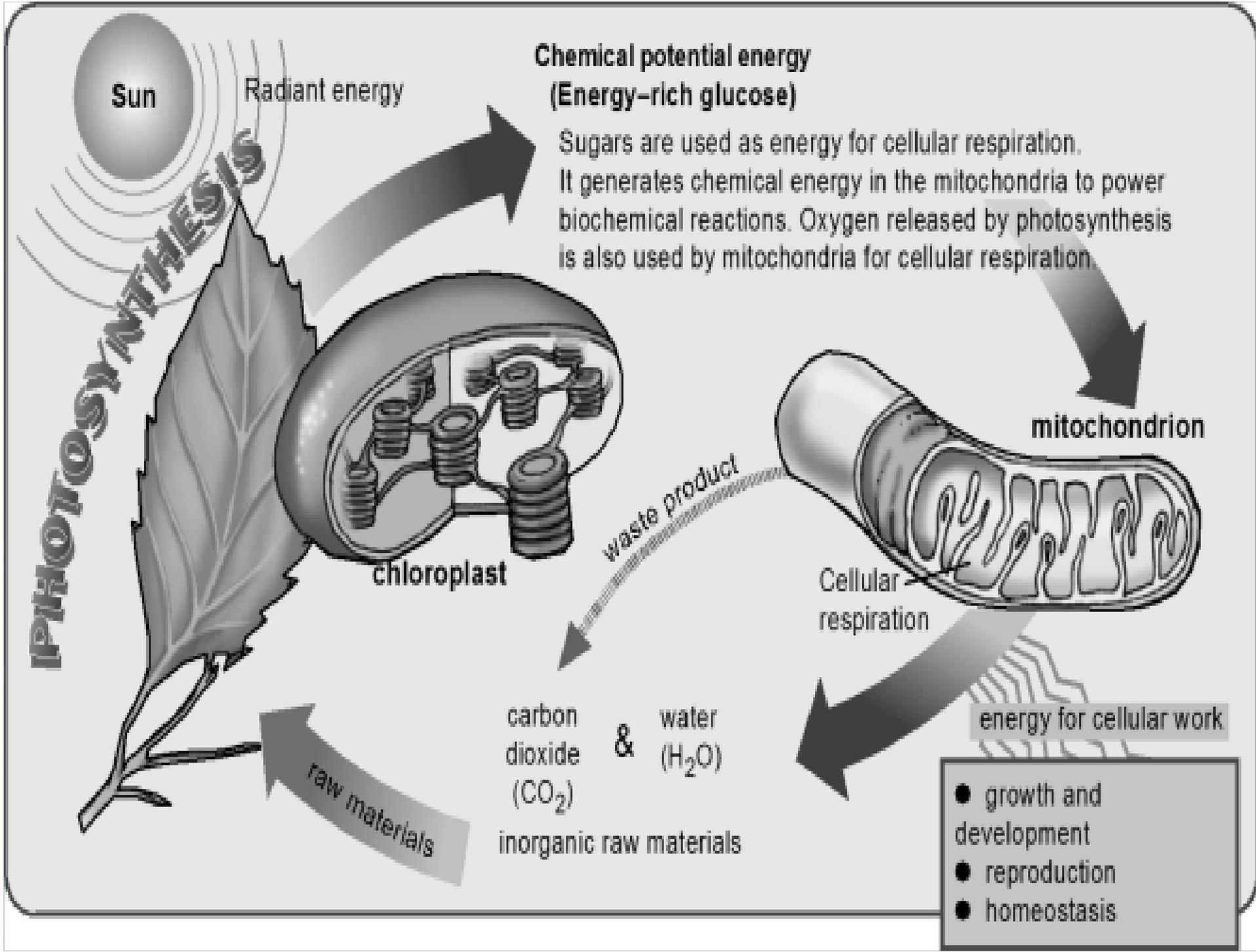


**How do the cow and grass help each other?**





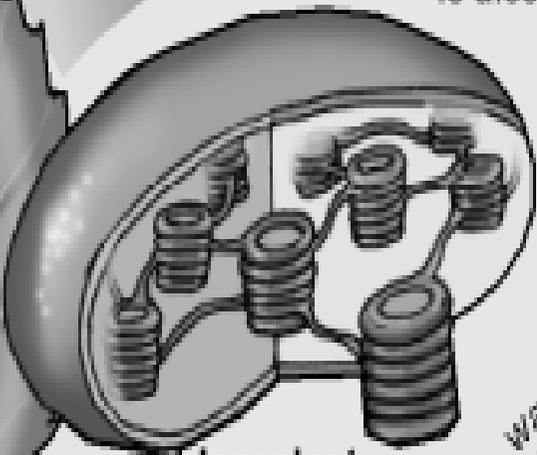
Sun

Radiant energy

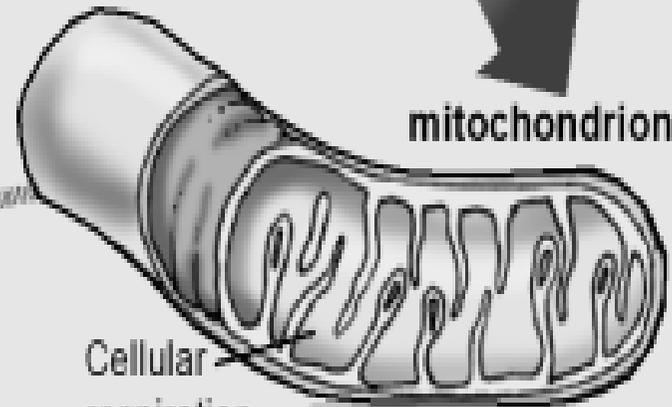
PHOTOSYNTHESIS

**Chemical potential energy  
(Energy-rich glucose)**

Sugars are used as energy for cellular respiration. It generates chemical energy in the mitochondria to power biochemical reactions. Oxygen released by photosynthesis is also used by mitochondria for cellular respiration.



chloroplast



mitochondrion

waste product

Cellular respiration

carbon dioxide (CO<sub>2</sub>) & water (H<sub>2</sub>O)  
inorganic raw materials

raw materials

energy for cellular work

- growth and development
- reproduction
- homeostasis

# Photosynthesis

(reactants)

(products)

Carbon Dioxide + Water + Energy → Glucose + Oxygen

# Cellular Respiration

(reactants)

(products)

Glucose + Oxygen → Carbon Dioxide + Water + Energy

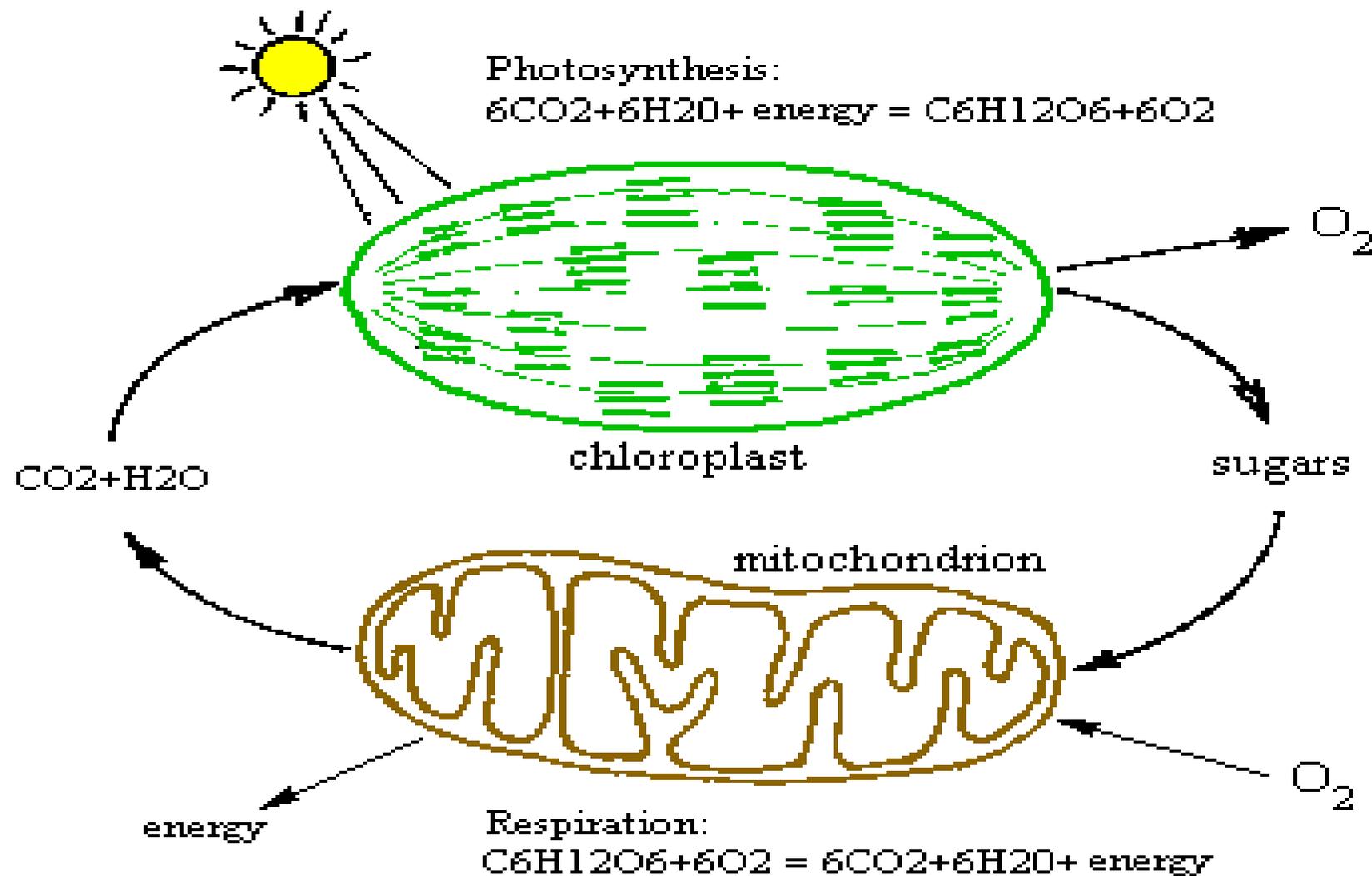


Figure 16 - With the photosynthesis, the solar energy is cumulated by the chloroplasts as sugar molecules. With the glycolysis and the respiration, made by mitochondria, the energy is liberated and supplied to the cell for its biochemical processes.



# PHOTOSYNTHESIS

an anabolic reaction

**Photo** means light and **synthesis** means put together.

# The sun emits a tremendous amount of energy!

This energy is harnessed by photosynthetic plants, heats the earth, and makes some people very uncomfortable.

Sunlight is the ultimate form of energy.

Thermodynamics = study of the transfer of Energy

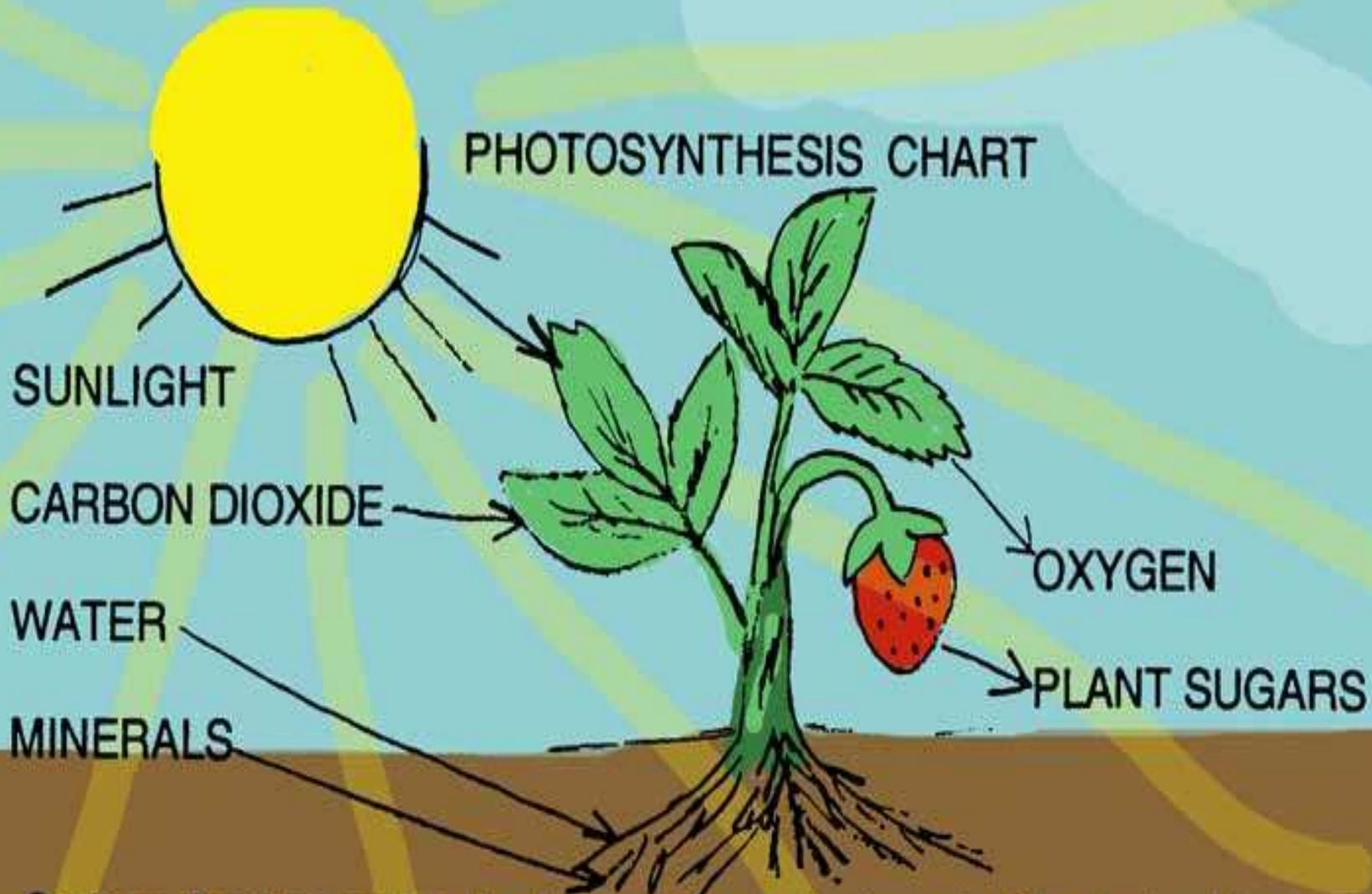
1<sup>st</sup> Law= e can't be created nor destroyed

2<sup>nd</sup> Law= e is lost as heat



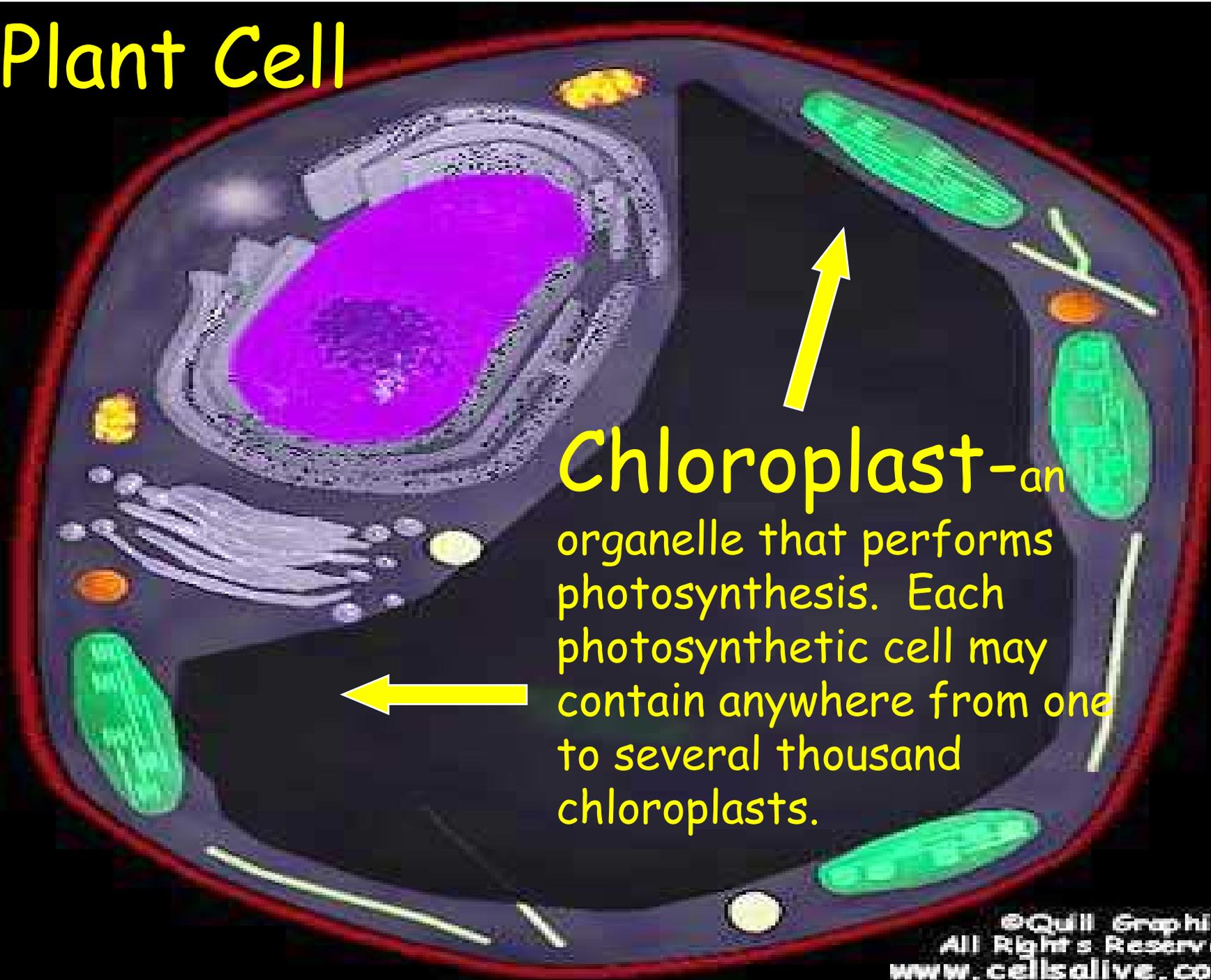


## PHOTOSYNTHESIS CHART



Carbon dioxide enters the leaves through stomata (tiny holes) in the leaves.

# Plant Cell

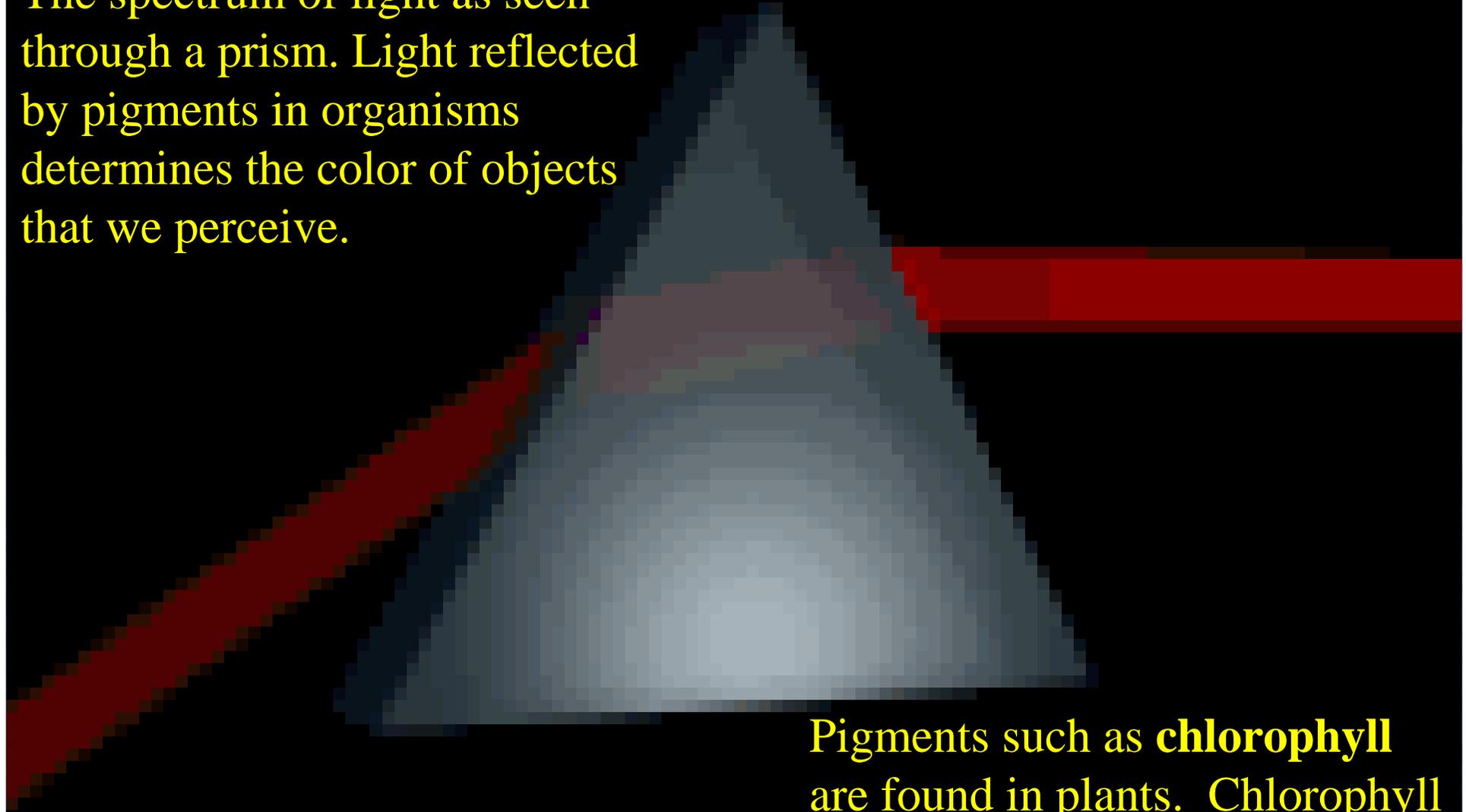


**Chloroplast**-an organelle that performs photosynthesis. Each photosynthetic cell may contain anywhere from one to several thousand chloroplasts.

# Photosynthesis

- the process by which autotrophs convert light energy to chemical energy by producing organic compounds.
- Photosynthesis occurs because of the presence of pigments, which absorb certain wavelengths of light while reflecting others.

The spectrum of light as seen through a prism. Light reflected by pigments in organisms determines the color of objects that we perceive.

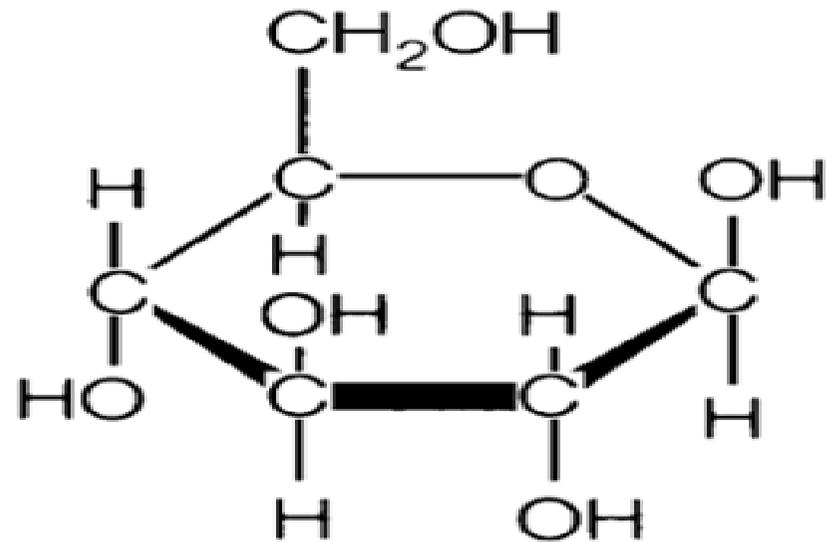


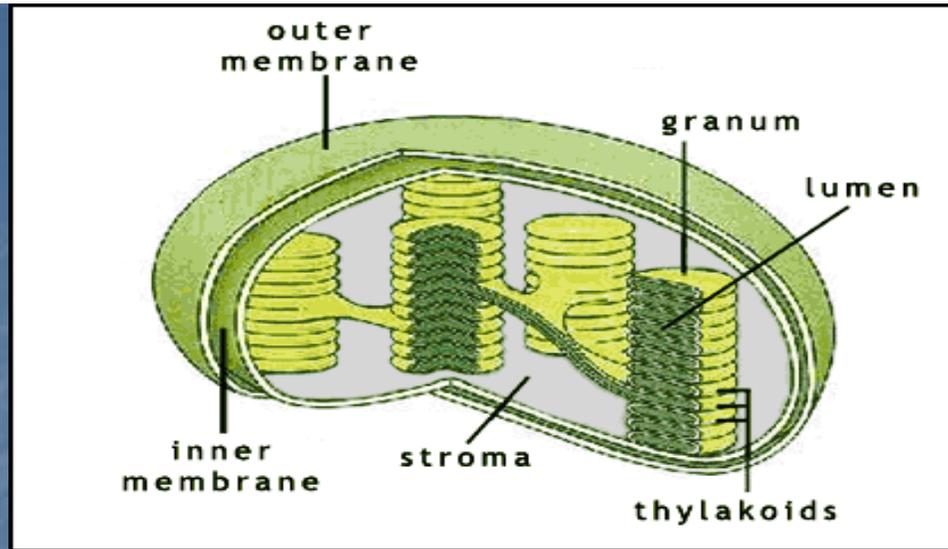
Pigments such as **chlorophyll** are found in plants. Chlorophyll reflects green light and absorbs violet, blue, and red light.

## Photosynthesis:

autotrophs convert light energy to a usable short term stored chemical energy by producing organic compounds (carbohydrates like glucose, starch, cellulose).

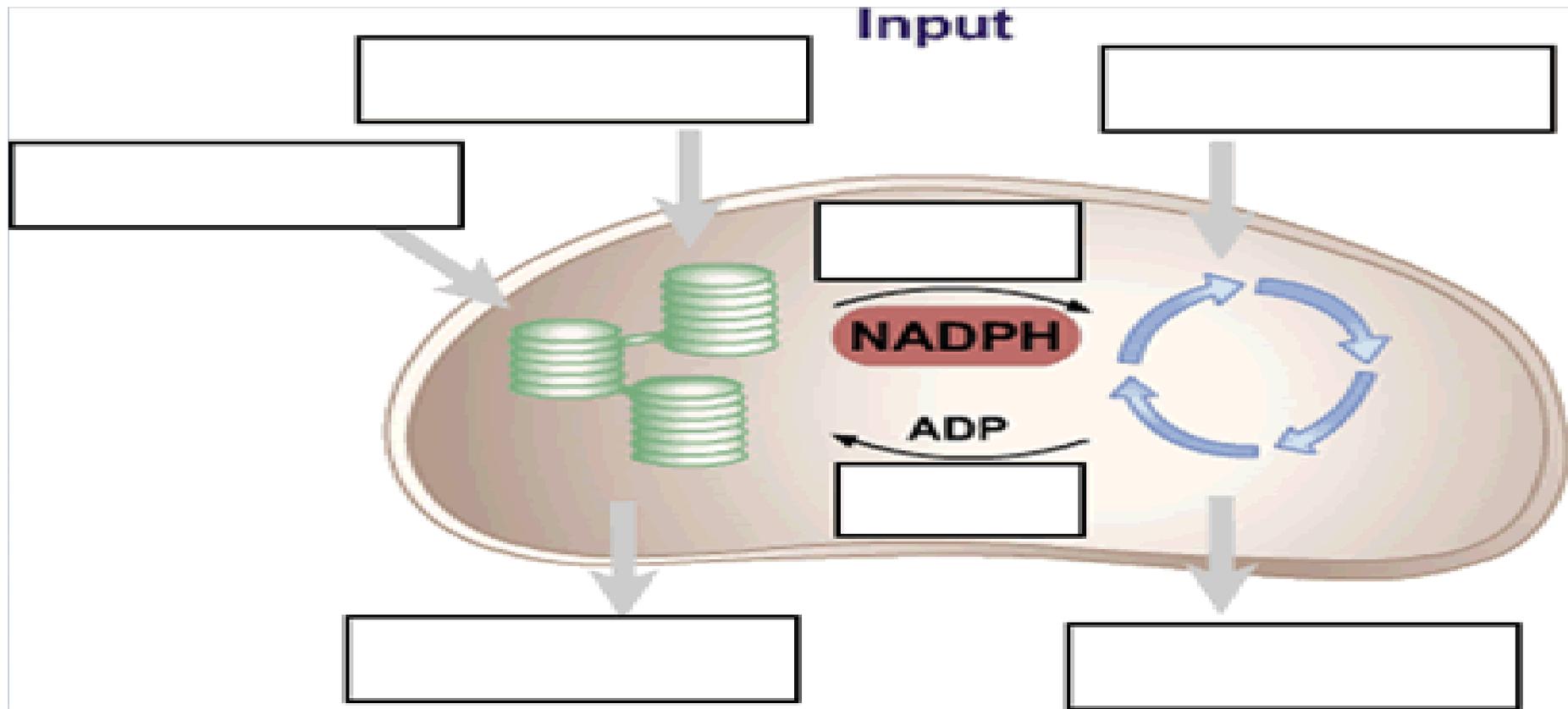
Plants assemble carbohydrate molecules from water and carbon dioxide, releasing oxygen as a byproduct.





- **Chlorophyll**-a photosynthetic pigment that absorbs violet, blue, and red light (the wavelengths of light that provide the energy for photosynthesis).
  - Chlorophyll is located in the **chloroplasts** of leaf cells, where clusters of pigments are embedded in the membranes of disc-shaped structures called **thylakoids**.
- **Chloroplast**-organelles common in plants and algae that converts sunlight, carbon dioxide, and water into sugars during the process of photosynthesis. Chloroplasts consist of the following structures:
  - **Granum (Grana)**-stacks of thylakoids inside a chloroplast
  - **Thylakoids**-disc-shaped structures within chloroplast, which contain chlorophyll
  - **Stroma**-gel-like matrix that surrounds grana.

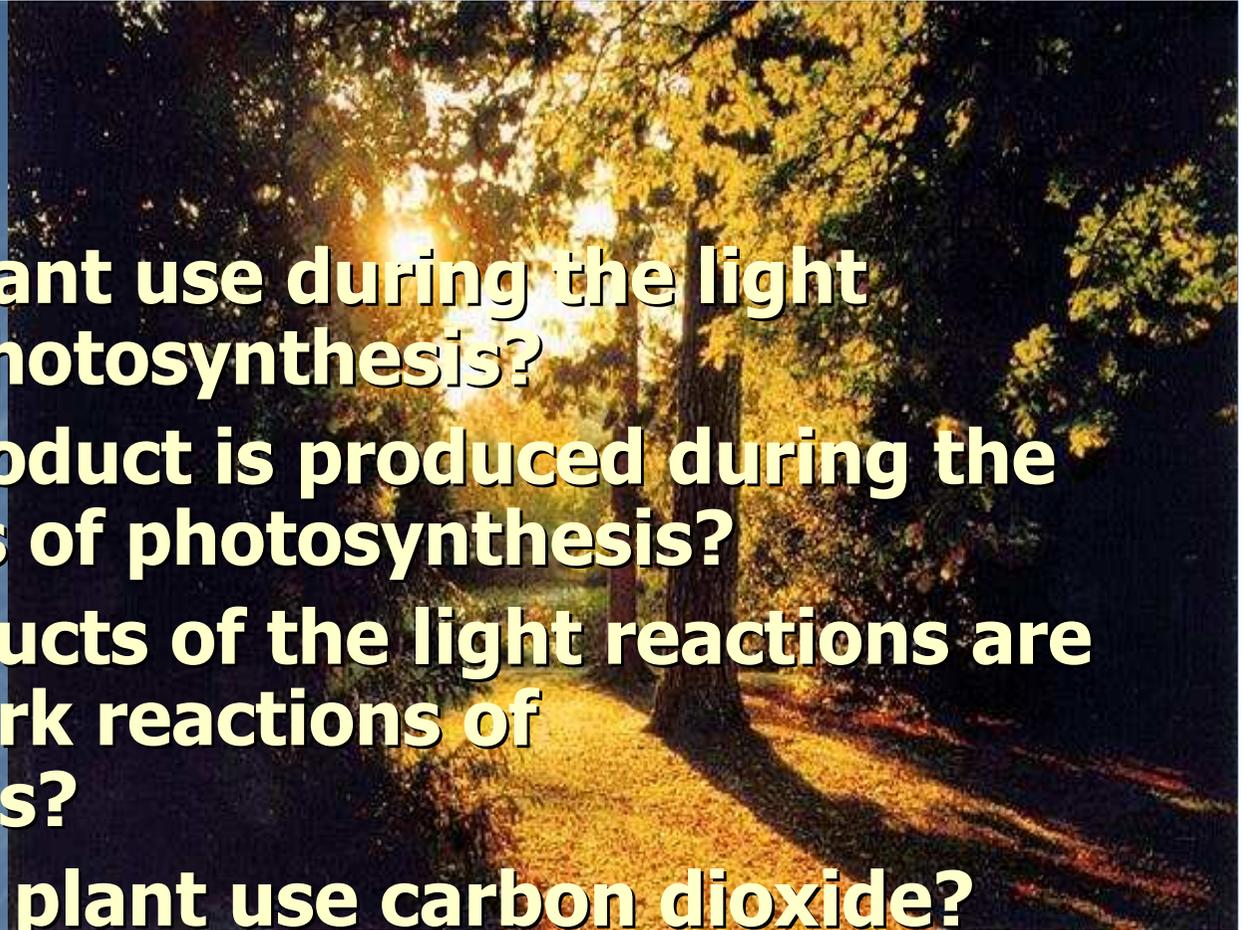




- Photosynthesis can be broken down into two parts:
1. Light Reactions (Sunlight and water are used to make ATP and NADPH)
  2. Dark Reactions (The ATP and NADPH from the light reactions, along with  $\text{CO}_2$  are used to make Glucose)

# Questions:

- 1. What does a plant use during the light reactions of photosynthesis?**
- 2. What waste product is produced during the light reactions of photosynthesis?**
- 3. What two products of the light reactions are used in the dark reactions of photosynthesis?**
- 4. When does the plant use carbon dioxide?**
- 5. Does photosynthesis only occur when there is light present? (why or why not)**
- 6. List all the ways in which a consumer (heterotroph), like a cow, benefits from photosynthesis:**



# Chromatography activity

- Technique for separating and identifying substances in a mixture, based upon their solubility in a solvent