Photosynthesis & Respiration

Overview of photosynthesis and respiration

SUN

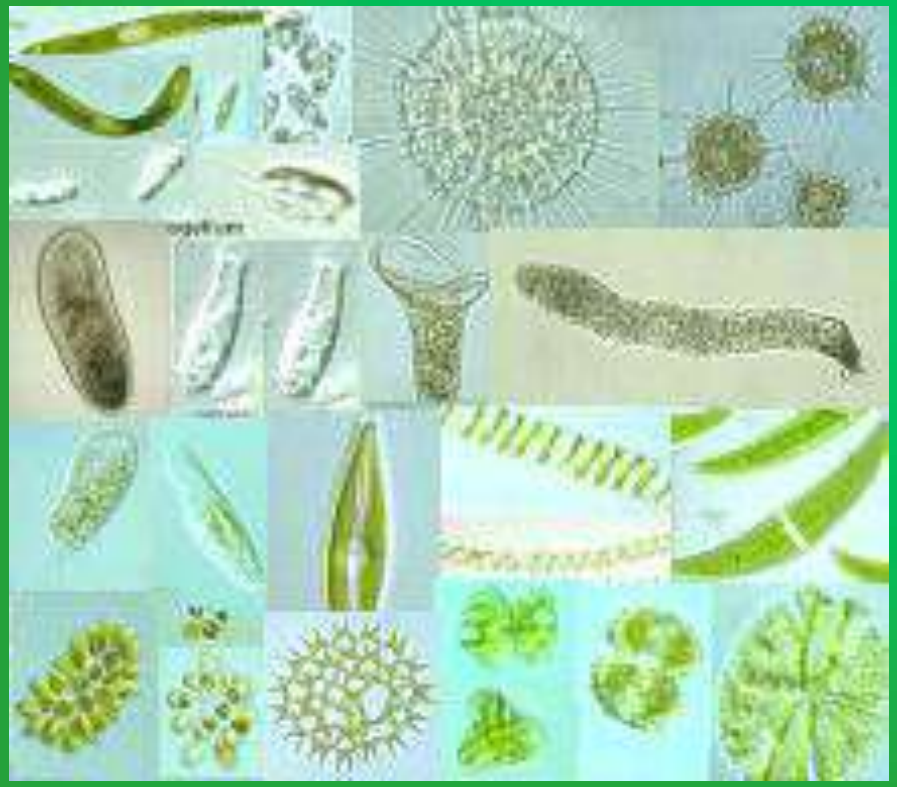
RADIANT ENERGY

PHOTOSYNTHESIS → RESPIRATION → CELL ACTIVITIES

GLUCOSE

ATP(ENERGY)

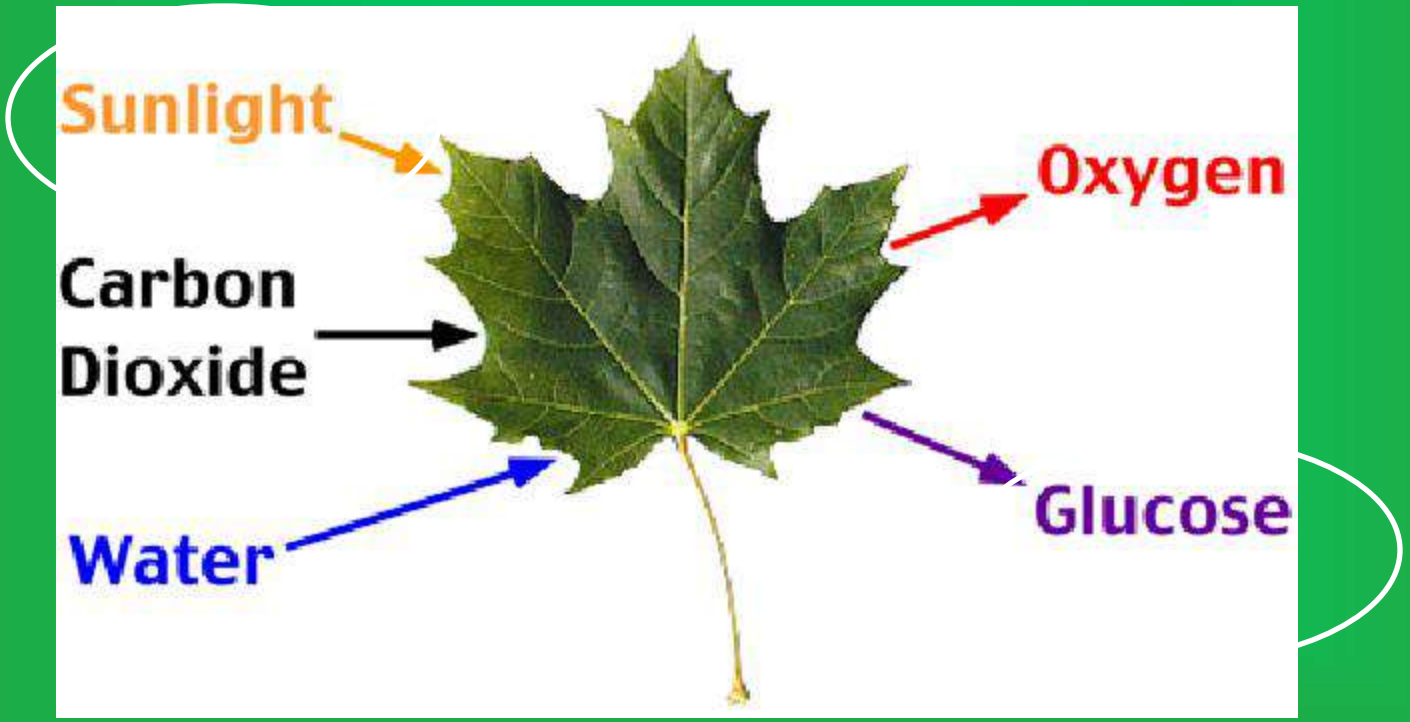
- Organisms that use **light energy** from the sun to produce food—**autotrophs** (auto = self)
  Ex: **plants** and some microorganisms (some bacteria and protists)



- Organisms that **CANNOT** use the sun's energy to make food—**heterotrophs**
  Ex: **animals** and most microorganisms

Photosynthesis:

- Photosynthesis is the process by which the energy of **sunlight** is **converted** into the energy of **glucose**



What is Photosynthesis?

The ***process*** of photosynthesis is a **chemical reaction**.

It is the most important
chemical reaction on our planet.

What is the Equation for the Chemical Reaction of Photosynthesis?

What is the equation for the chemical reaction of photosynthesis?

Light Energy

Carbon Dioxide + Water → Glucose + Oxygen

EQUATION FOR PHOTOSYNTHESIS

WATER

OXYGEN

$$6CO_2 + 6H_2O + ENERGY \rightarrow C_6H_{12}O_6 + 6O_2$$

CARBON DIOXIDE

GLUCOSE

Describe Photosynthesis

Describe Photosynthesis

- The process of changing light energy to chemical energy
- Energy stored as sugar
- Occurs in plants and some algae
- Plants need light energy, CO_2, and H_2O
- Takes place in the **chloroplasts**, using **chlorophyll**, the green pigment in plants

- **Chlorophyll** is the pigment inside the **chloroplast** that absorbs light for photosynthesis

As the chlorophyll in leaves decays in the autumn, the green color fades and is replaced by the oranges and reds of carotenoids, other pigments.

What happens during photosynthesis?

What happens during photosynthesis?

- Plants capture light energy and use that energy to make glucose
- Sunlight provides the energy needed by chlorophyll to change molecules of carbon dioxide and water into glucose
- Oxygen is also released in this reaction

What happens during photosynthesis?

- Carbon dioxide enters the leaf through holes called stomata
- CO_2 combines with the stored energy in the chloroplasts through a chemical reaction to make glucose

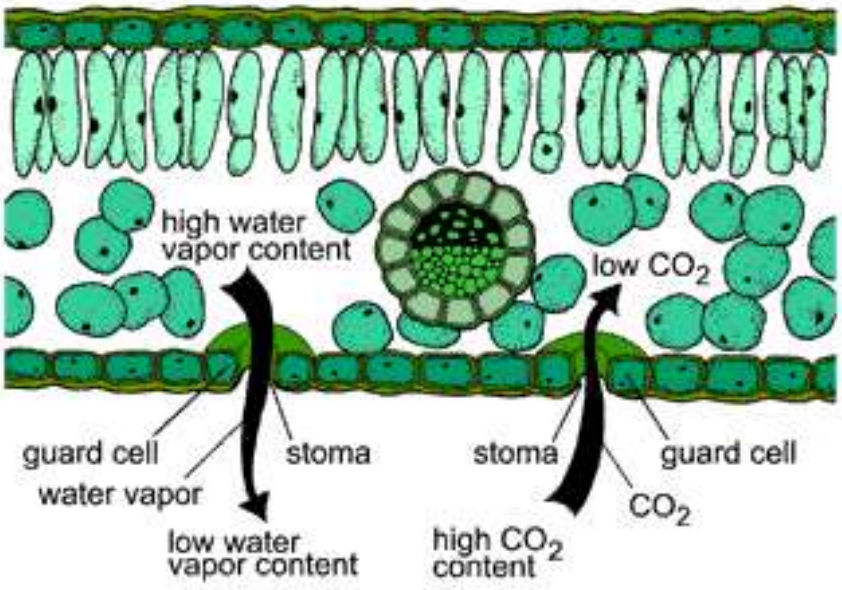
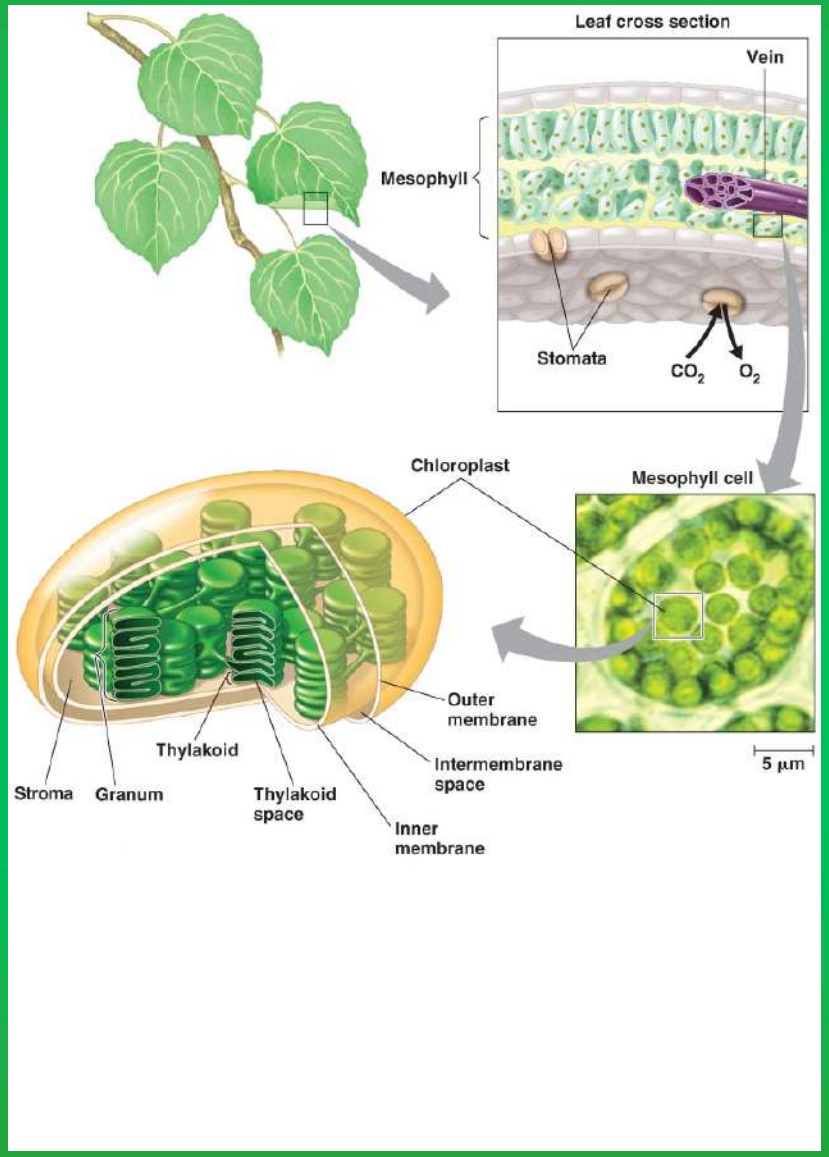


Figure 25. Stomata open to allow carbon dioxide (CO_2) to enter a leaf and water vapor to leave.

- Photosynthesis occurs in the **chloroplasts** of plants



What happens during photosynthesis?

- The sugar is moved through tubes in the leaf to the roots, stems and fruits of the plants
- Some of the sugar is used right away by the plant for energy; some is stored as starch; and some is built into plant tissue

Why is this important to us?

Why is this important to us?

We cannot make our own food (glucose, energy), we must get our food from plants.

Plants are the first step in the food chain.

Why is this important to us?

The oxygen released during photosynthesis is necessary for all living things.

What is Cellular Respiration?

What is Cellular Respiration?

The release of chemical energy for use by cells.

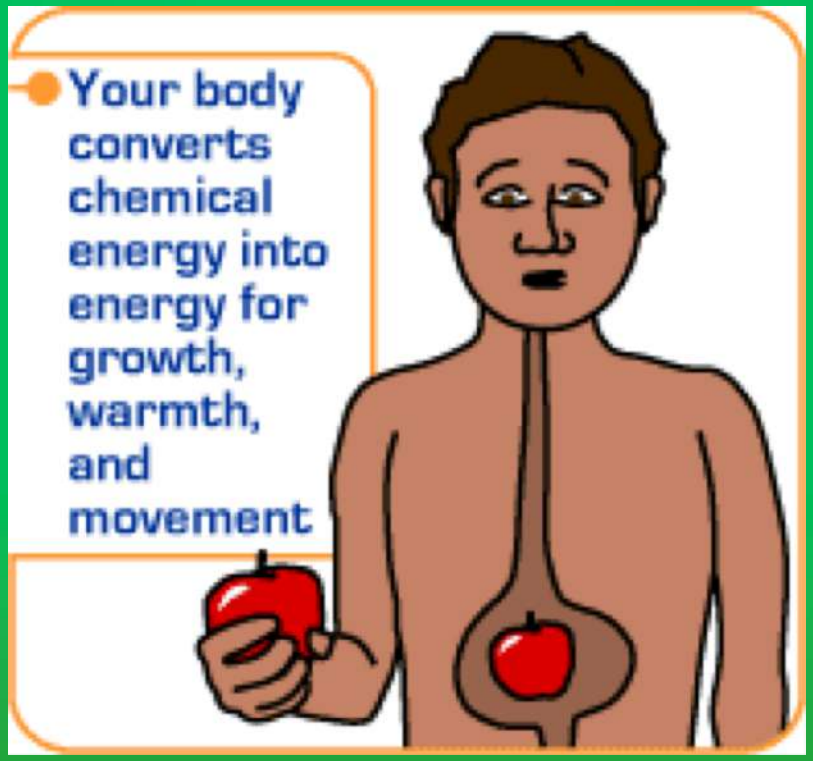
What is Cellular Respiration?

Once the energy that was in sunlight is changed into chemical energy by photosynthesis, an organism has to transform the chemical energy into a a form that can be used by the organism.

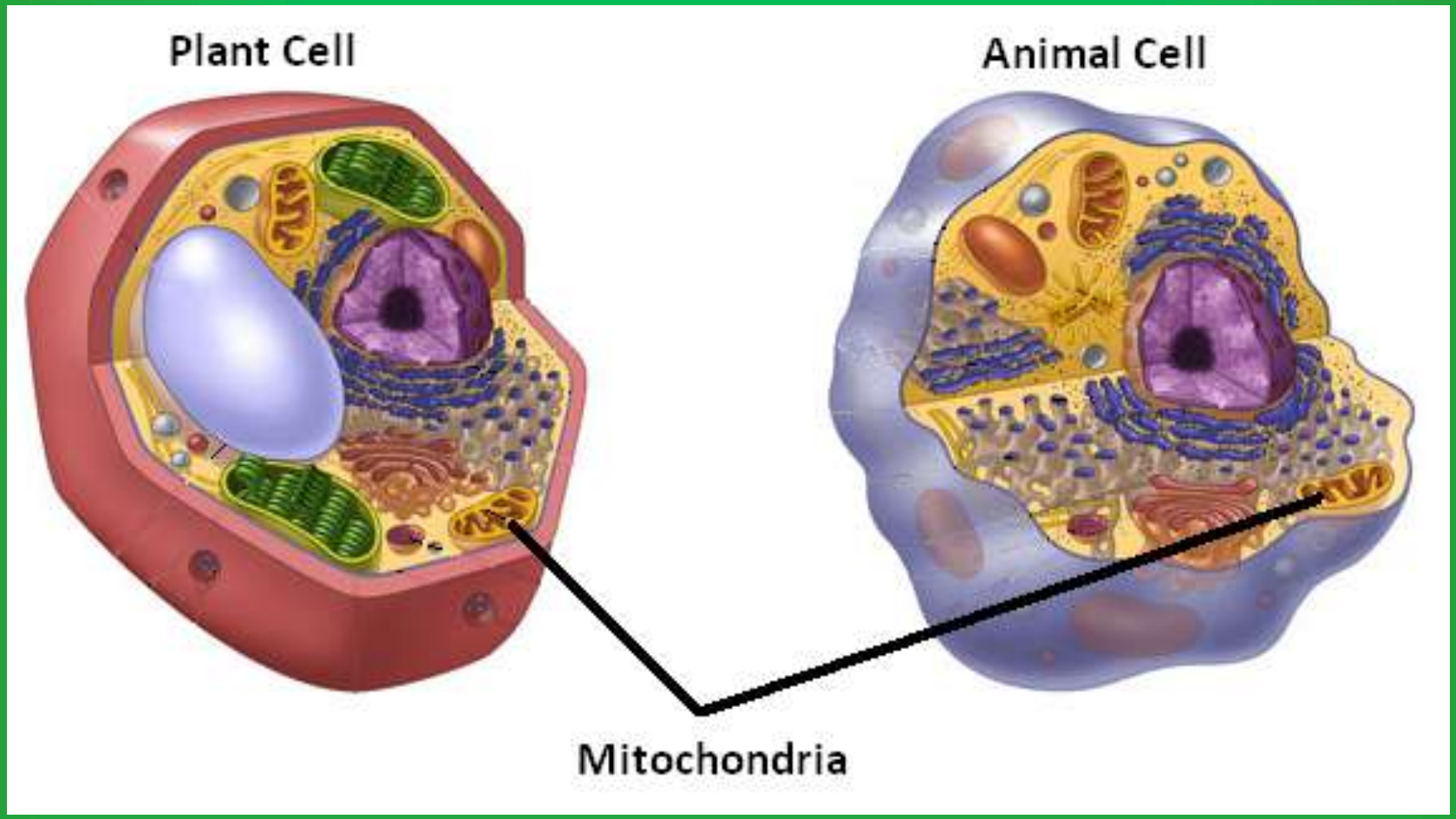
This process is cellular respiration.

Cellular Respiration:

Cellular respiration is the process by which the energy of **glucose** is **released** in the cell to be used for life processes (**movement, breathing, blood circulation**, etc…)



- Respiration occurs in **ALL cells** and can take place either **with or without oxygen** present.



Describe Cellular Respiration

Describe Cellular Respiration

- The breakdown of glucose molecules to release energy
- Turns glucose into ATP
- Takes place in all living things
- Is a step by step process

What is the chemical equation for cellular respiration?

EQUATION FOR RESPIRATION

GLUCOSE

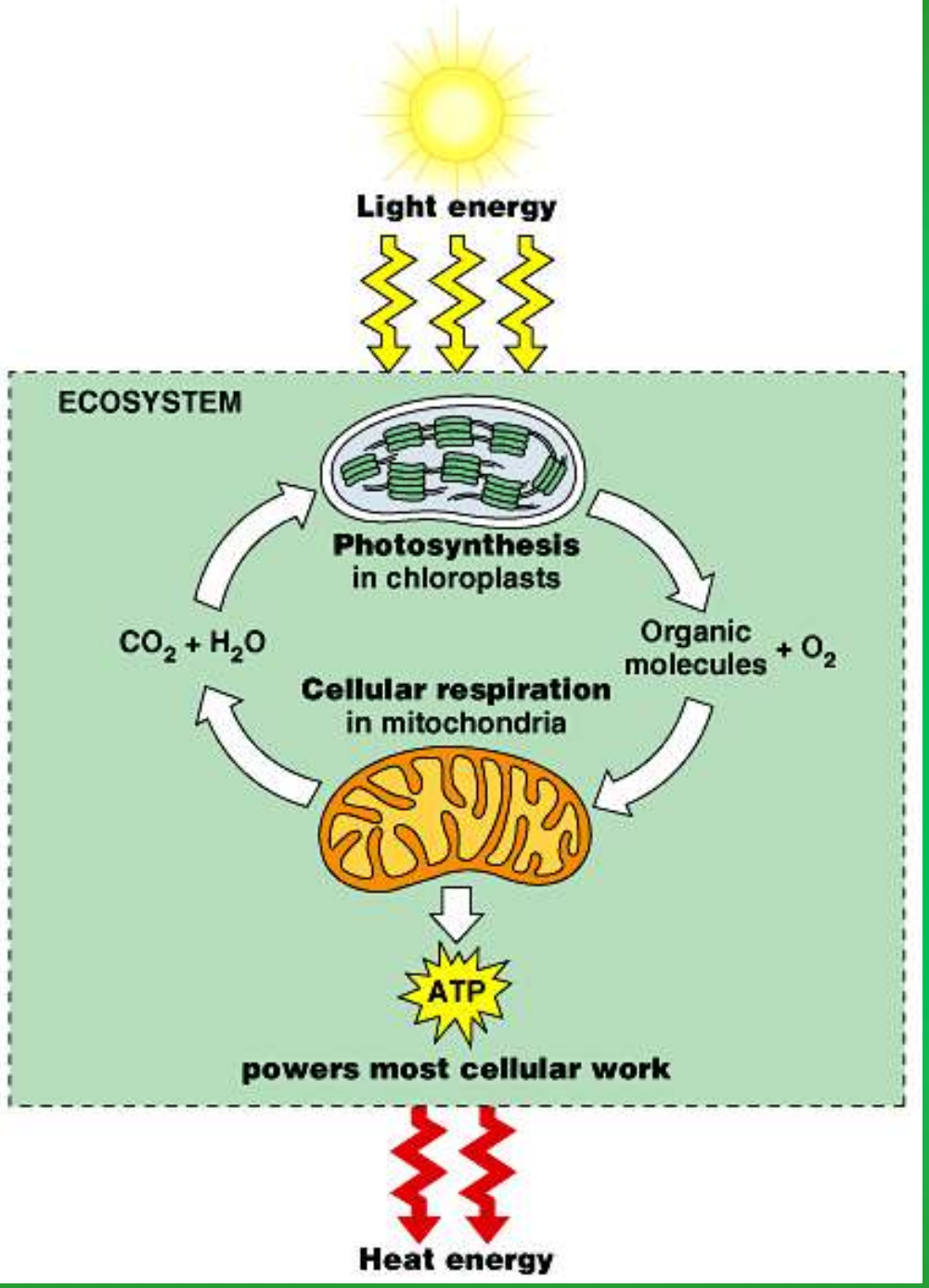
CARBON DIOXIDE

ATP

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ENERGY$$

OXYGEN

WATER


Light energy
ECOSYSTEM
Photosynthesis
in chloroplasts
$CO_2 + H_2O$
Organic
molecules
$+ O_2$
Cellular respiration
in mitochondria
ATP
powers most cellular work
Heat energy