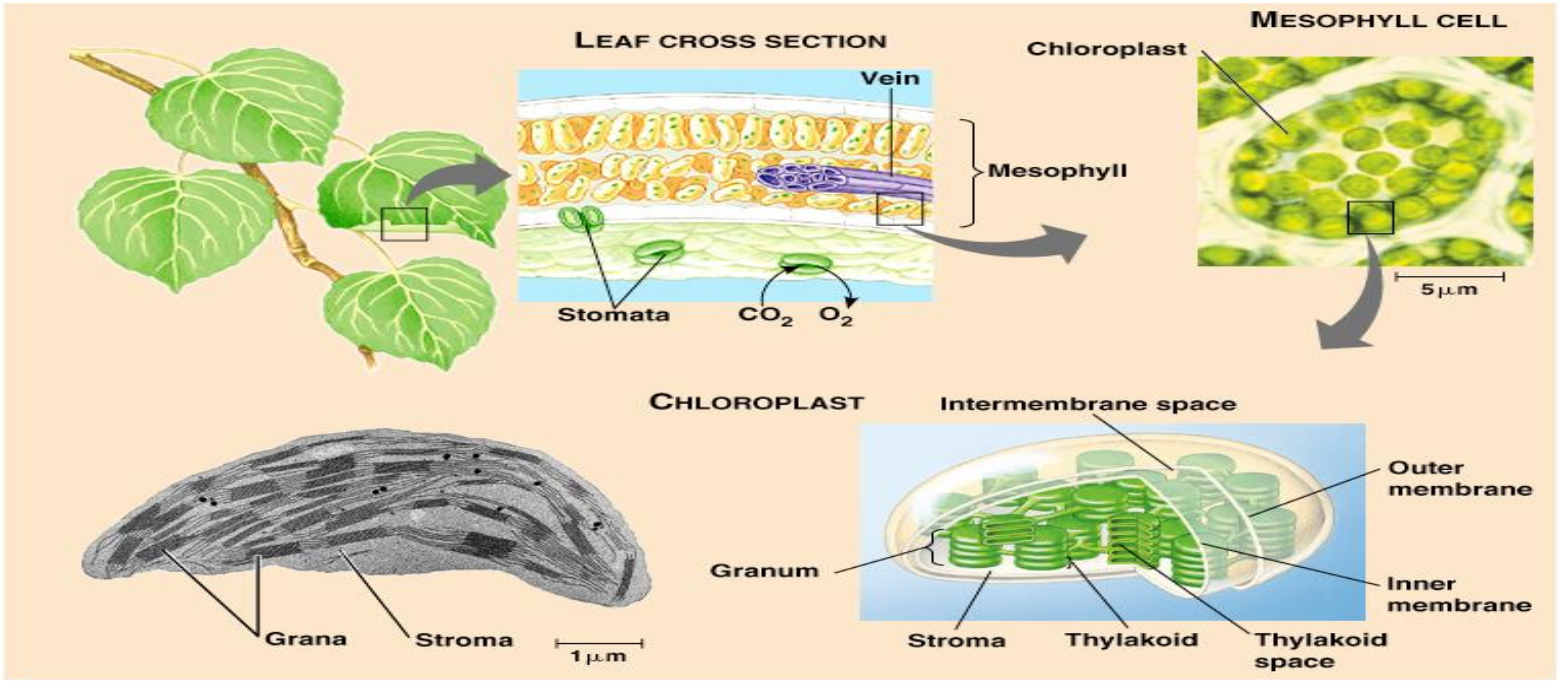
Keystone Biology Review Bioenergetics

Photosynthesis

Is the process whereby organisms convert light energy into chemical bond energy of glucose

- It occurs in the Chloroplasts of plant cells



Photosynthesis vs. Respiration

- Think of Photosynthesis like baking a cake. The plant takes raw material (CO_2 and H_2O) and uses light energy to make Glucose (and releases O_2 in the process)

Respiration is the process whereby organisms break down glucose to provide energy to all life processes

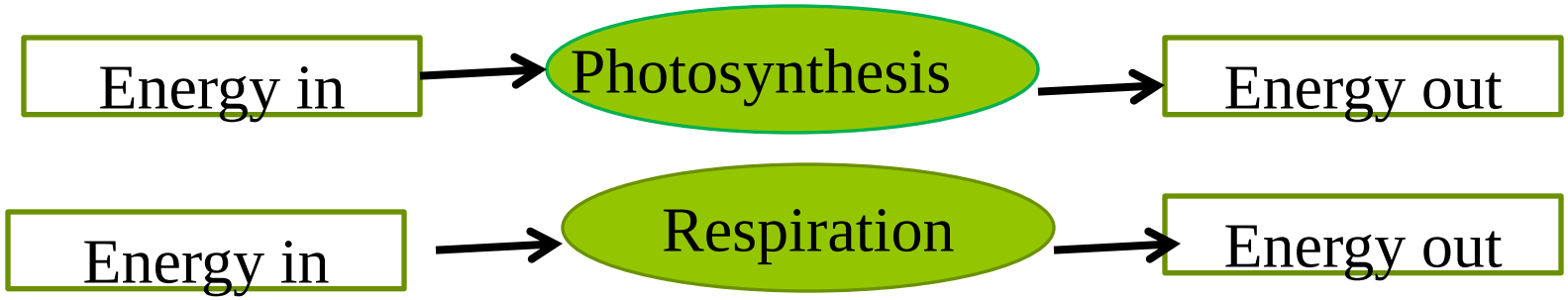
Breaks down glucose (sometimes with O_2 and others without it), transfers energy to a small energy transferring compound called ATP

- Think of Respiration like burning the cake. Energy is released from the bonds of glucose to be stored as ATP.

All plants (photosynthetic organisms) undergo both Photosynthesis (only in the presence of light) and Respiration (all of the time)

All living organisms must go through respiration 24/7

Use the diagrams below to answer the question.

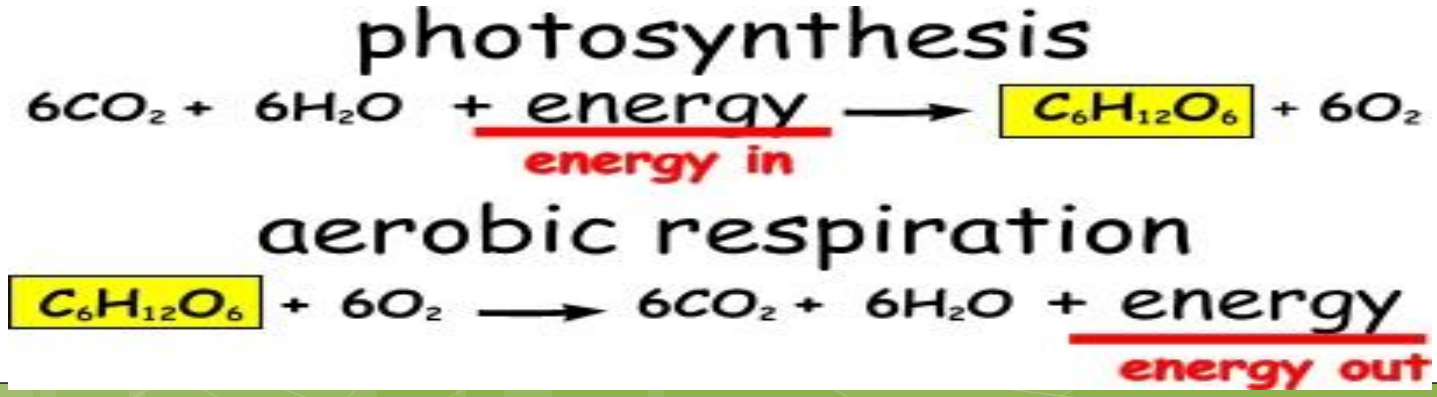


- **Part A**: Complete the chart below by describing energy transformations involved in each process.

Process	Energy Transformations
Photosynthesis	*CO_2 and H_2O are transformed using the energy from sunlight to create $C_6H_{12}O_6$ and O_2. The captured and used energy is stored in the chemical bonds of glucose ($C_6H_{12}O_6$)*
Cellular Respiration	*O_2 and $C_6H_{12}O_6$ are broken down with a small amount of invested energy to form $CO_2 + H_2O$ and a large amount of ATP which is the energy storage molecule of living things*

Part B : Describe how energy transformations involved in photosynthesis are related to energy transformations involved in cellular respiration.

- *They are, in essence, the reverse of each other. The products of photosynthesis become the reactants for cellular respiration, and the opposite is true.*
- Again, one bakes the cake and the other one breaks it down to release the energy



Which of the following best describes one function of chloroplasts in a plant cell?

A. storage of wastes

B. capture of solar energy

C. regulation of water transport

D. release of energy from carbohydrates

B. capture of solar energy

- Chloroplast

Which statement best compares the energy transformations of photosynthesis and cellular respiration?

A. Only photosynthesis uses oxygen to create energy.

B. Only photosynthesis causes an increase in kinetic energy.

C. Photosynthesis and respiration both store energy in chemical bonds.

D. Photosynthesis and respiration both require chemical energy to make food.

C. Photosynthesis and respiration both store energy in chemical bonds.

- Photosynthesis vs. Respiation

During the light reactions of photosynthesis, light energy is converted to chemical energy in the form of which molecules?

A. ATP and NADPH

B. $FADH_2$ and NADH

C. ATP, CO_2, and H_2O

D. Glucose, CO_2, and H_2O

A. ATP and NADPH

- Photosynthesis Video Link

Photosynthesis involves two stages: the light-dependent reaction and the Calvin cycle (light-independent reaction). Which statement accurately describes these two stages?

A. the light reaction provide ATP and NADPH to power the Calvin cycle.

B. the light reaction makes glucose; the Calvin cycle makes ATP and NADPH.

C. the Calvin cycle provides glucose to power the light-dependent reaction.

D. the Calvin cycle uses light energy to make CO_2; the light reaction uses CO_2

A. the light reaction provide ATP and NADPH to power the Calvin cycle.

- Photosynthesis

Which energy transformation occurs within mitochondria?

A. ATP to light

B. Heat to electrical

C. Light to chemical

D. Chemical to chemical

D. Chemical to chemical

- Cellular Respiration

During glycolysis, which energy transformation is completed?

A. production of NADH, FADH2, and ATP from pyruvate

B. production of glucose and NAD+ farm pyruvate and ATP

C. conversion of NADH to NAD+ and production of 4 ATP molecules per glucose molecule

D. conversion of NAD+ to NADH and net production of 2 ATP molecules per glucose molecule

D. conversion of NAD+ to NADH and net production of 2 ATP molecules per glucose molecule

- Glycolysis