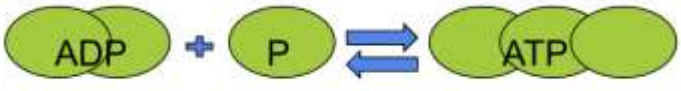
Notes: Energy in Ecosystems from the Process of Photosynthesis

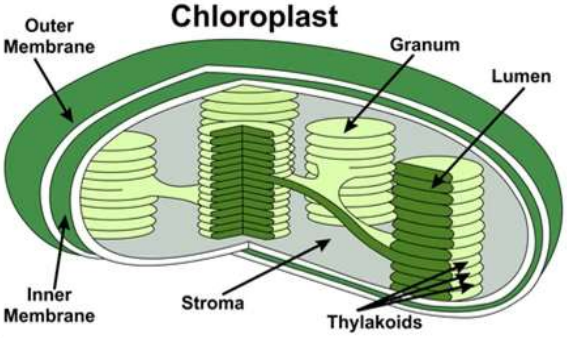
EQ: Explain this joke - one plant asked the other "Are you hungry?", the other replied "I could go for a light snack".

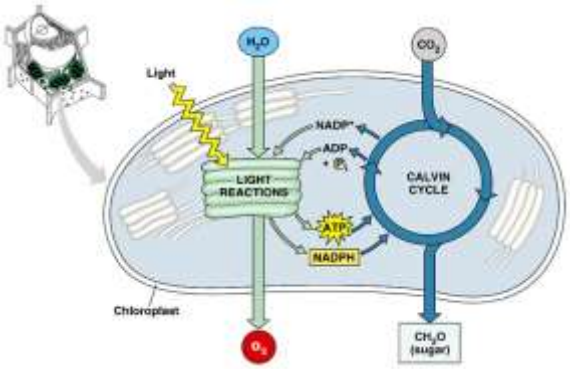
I. Energy
- A. Energy comes in many forms:
  1. Chemical
  2. Heat
  3. Electricity
- B. Energy can be stored in chemical compounds
  1. Carbs or lipids
- C. Cells use/store energy in the form of ATP
  1. Adenosine triphosphate
  2. Energy ready to be stored can be added to ADP to make ATP.
  3. Converting ATP back into ADP releases energy



- D. Using Energy
  1. Cells use ATP to:
     a) carry out active transport
     b) To make proteins

II. Autotrophs
- A. Plants and some other types of organisms are able to make their own food from sunlight
- B. These organisms are called autotrophs or producers.
  1. They PROVIDE energy for all organisms in ecosystem
- C. How Autotrophs Make Energy
  1. $6\ H_2O + 6\ CO_2 \rightarrow C_6H_{12}O_6 + 6\ O_2$
     water + carbon dioxide → glucose + oxygen
  2. In the presence of light, autotrophs transform carbon dioxide (CO_2) and water (H_2O) into carbohydrates (glucose) and oxygen; this process is called PHOTOSYNTHESIS
  3. Occurs in the chloroplasts of plants
  4. Where do the reactants come from?
     a) Light energy → the sun
     b) CO_2 →the air through the stomata
     c) H_2O → the roots via adhesion and cohesion
  5. Inside the chloroplast
     a) Chloroplast is made of 2 membranes The inner membrane makes giant stacks of circular structures called thylakoids
     b) The area inside the membrane but outside the grana is stroma
     c) Photosynthesis inside a stroma





(1) First sunlight energy and water make ATP and NADPH molecules in the thylakoid membranes in light dependent reactions.

(a) Oxygen is released as waste

(2) Then we use the NADPH and ATP to make Glucose in the (stroma) of chloroplast from Carbon Dioxide in light Independent reactions (or Calvin Cycle)

(3) Glucose is used by cells to make energy in mitochondria via Cell Respiration.

III. Heterotrophs

A. Heterotrophs are organisms that obtain energy from the food they eat.

1. Could eat autotrophs (herbivore)
2. Could eat an animal which consumed an autotroph (carnivore)
3. Could also be an omnivore (both)!