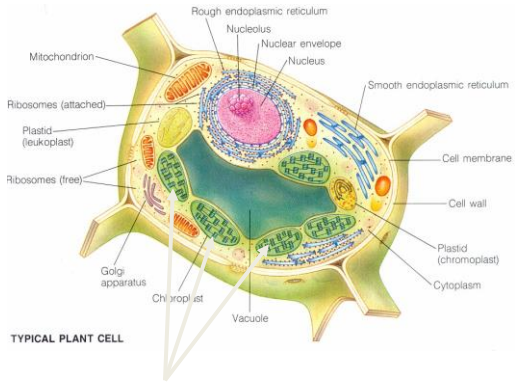
Life Science

Chapter 2

Plant Cell

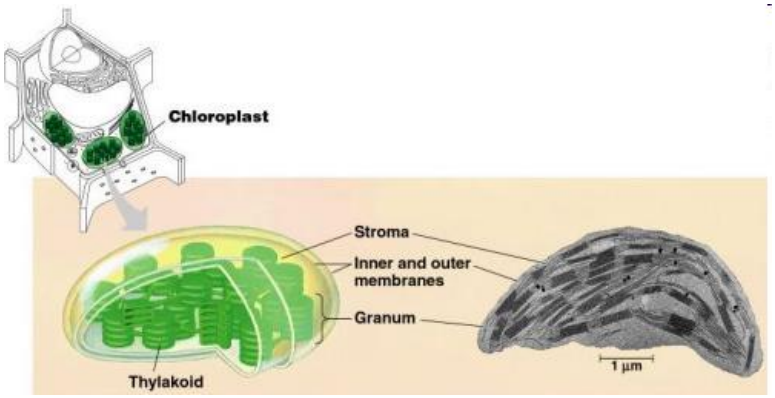
- Plants are autotrophs – they make their own food.
- They use the process of photosynthesis to convert energy from the sun in the form of EMR into glucose.
- Glucose stores the chemical energy until needed by the plant.
- Photosynthesis takes place in the chloroplasts found in plant cells.



Photosynthesis takes place in the chloroplasts of plant cells

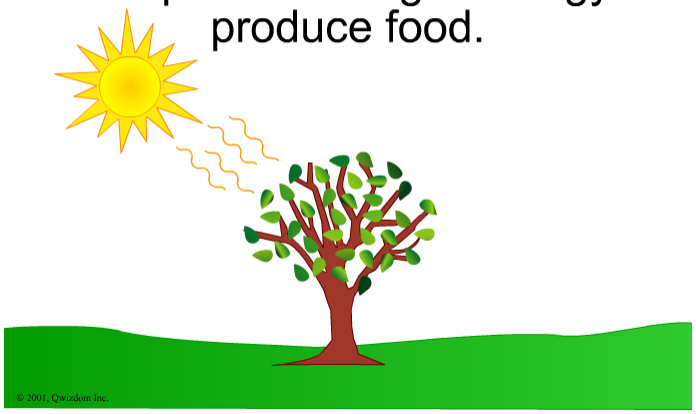
Chloroplast

- 2 main parts surrounded by membranes
  - **Grana** – stacks of Thylakoids "coins"
  - **Stroma** – aqueous space between grana



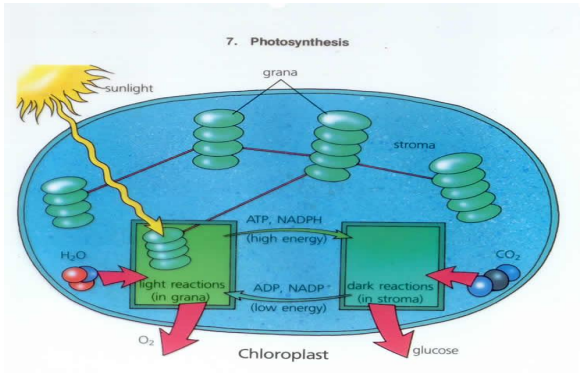
Photosynthesis

Photosynthesis is a process in which plants use light energy to produce food.



Photosynthesis:

- **Converts sunlight energy into food for the plant.**
- **Takes place in the chloroplast**
- **Has a light (grana) & dark reaction (stroma)**
- **$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$**



Photosynthesis: overall reaction

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

Reactants: carbon dioxide & water

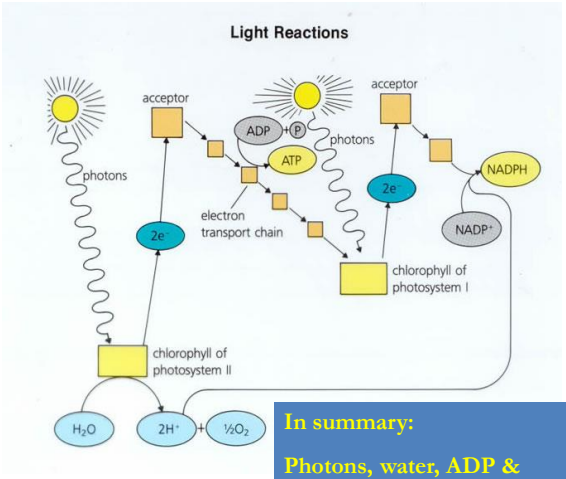
In the presence of sunlight & chlorophyll

Yield

Products: Glucose and oxygen

Light Reaction – Takes place in the Grana

- Requires sunlight
- Photons from sun & water, H_20, from the plant come into the grana.
- Chlorophyll kicks off an electron from the splitting of H_2O into hydrogen & Oxygen.
- ADP (low energy) is converted into ATP (high energy)
- $NADP^+$ (low energy) is converted into NADPH (high energy)



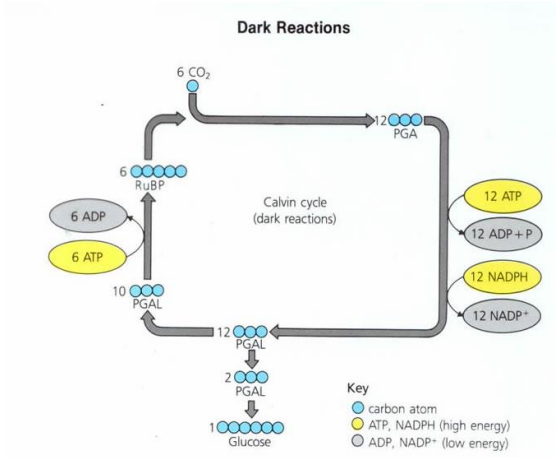
In summary:

Photons, water, ADP & $NADP^+$ in…

Oxygen, ATP & NADPH out

Dark Reaction – Takes place in the Stroma

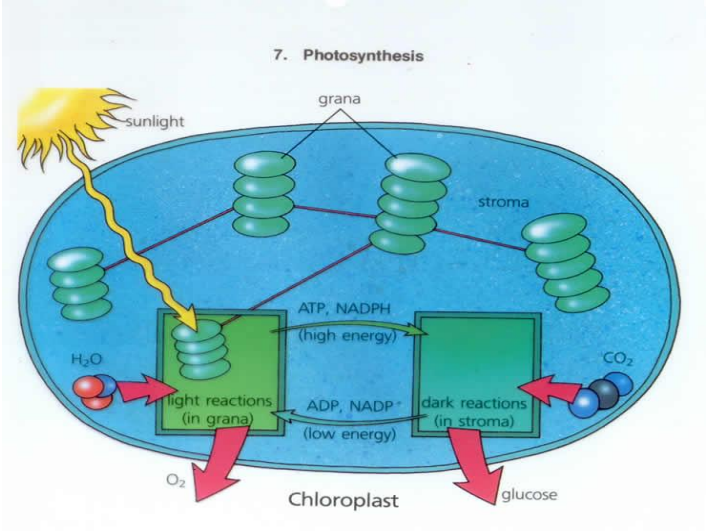
- Takes place day or night, no sun required
- ATP (high energy) & NADPH (high energy) along with carbon dioxide in the stroma.
- Goes through the Calvin Cycle and converts them into glucose.
- ADP (low energy) & $NADP^+$ (low energy)
- ATP & NADPH are short term high energy molecules
- ADP & NADP+ are short term low energy molecules
- Glucose is a long term high energy molecule



In summary: Carbon dioxide, ATP & NADPH in…

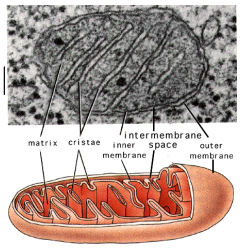
Glucose, ADP & $NADP^+$ out

Photosynthesis - Summary



Cellular Respiration

- **$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$**
- Plants store energy as glucose made during the process of photosynthesis. ($6CO_2+6H_2O \rightarrow C_6H_{12}O_6+6O_2$)
- Both plants & animal cells utilize glucose & release the stored energy.
- Energy released by cells done mainl in the Mitochondria



Aerobic Cellular Respiration

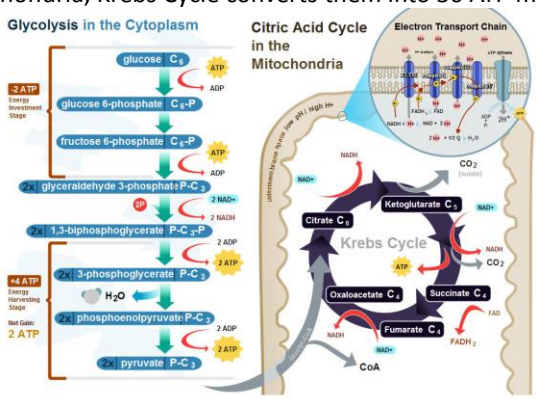
- 2 Part Process:
  - In the cytoplasm, Glucose molecule is broken into 2 pyruvate molecules
  - In the mitochondria, Krebs Cycle converts them into 36 ATP molecules

Remember:

$C_6H_{12}O_6$ –Glucose, long term high energy

ATP –adenosine triphosphate. Short term high energy

ADP –adenosine diphosphate. Short term low energy



Anaerobic Respiration

- 2 types: **Alcohol & Lactic Acid Fermentations**
  - **Alcohol** - yeast, a fungus, converts sugars into alcohol & releases energy
  - **Lactic Acid** - muscles without enough Oxygen convert sugars into lactic acid to release the needed energy for contractions.