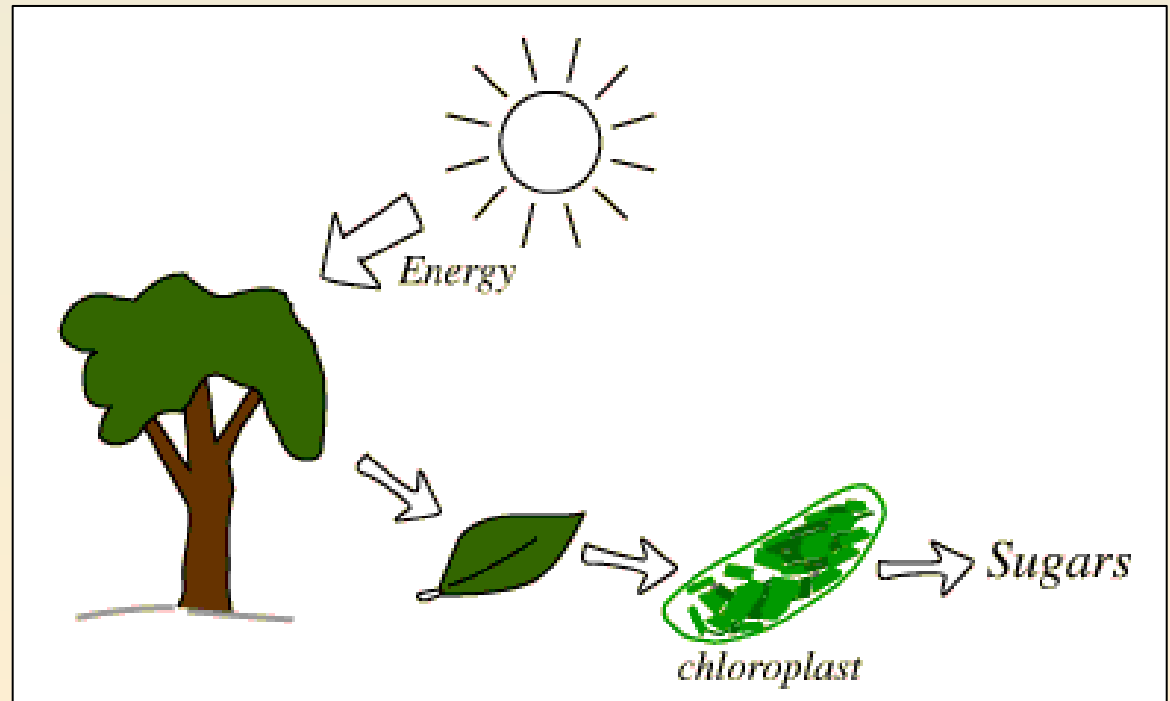
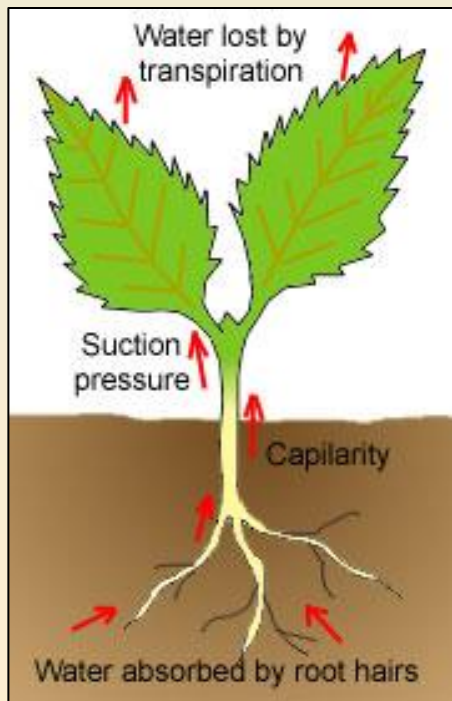


# Plant Physiology

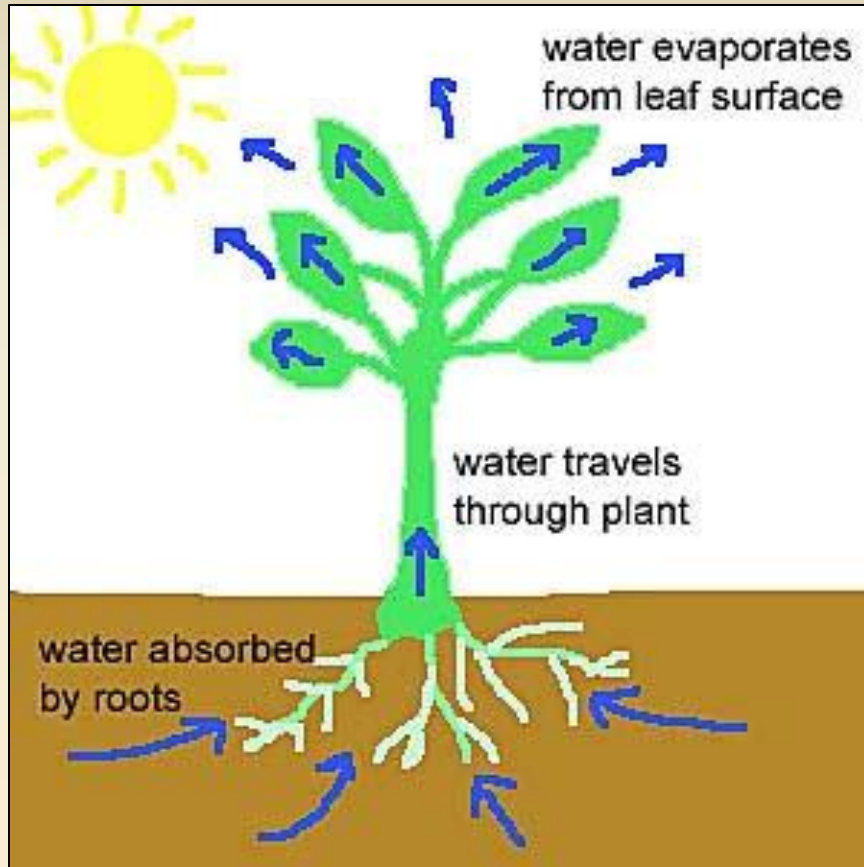
Transpiration

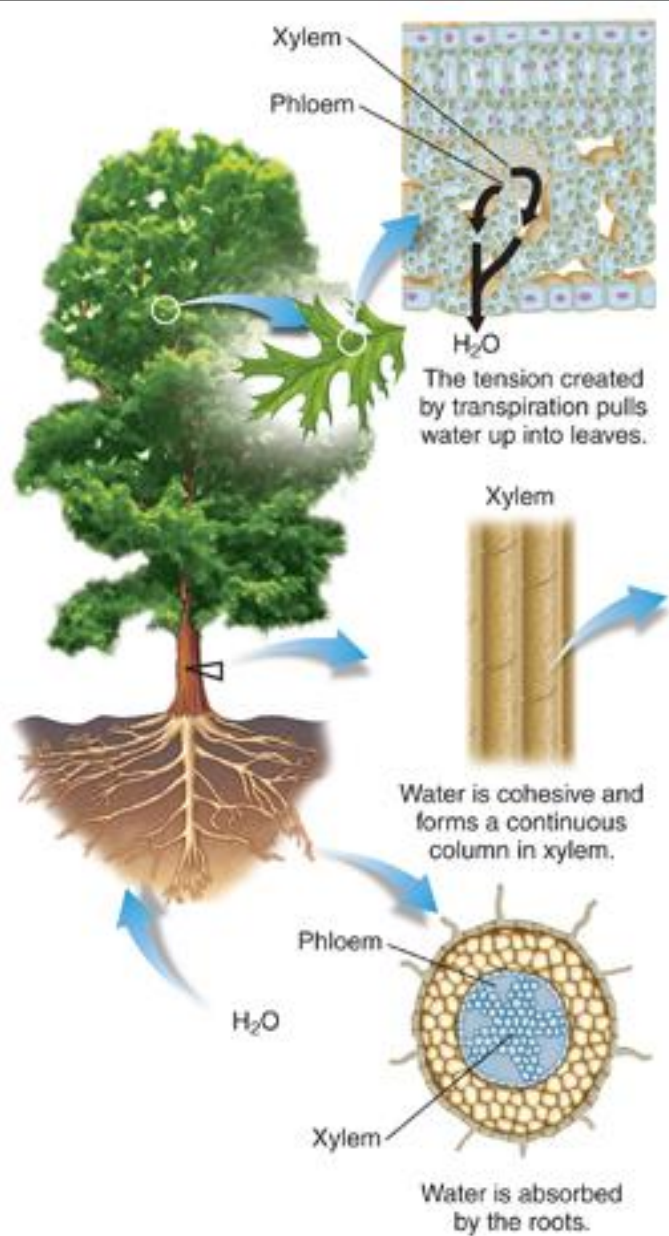
Translocation

Photosynthesis

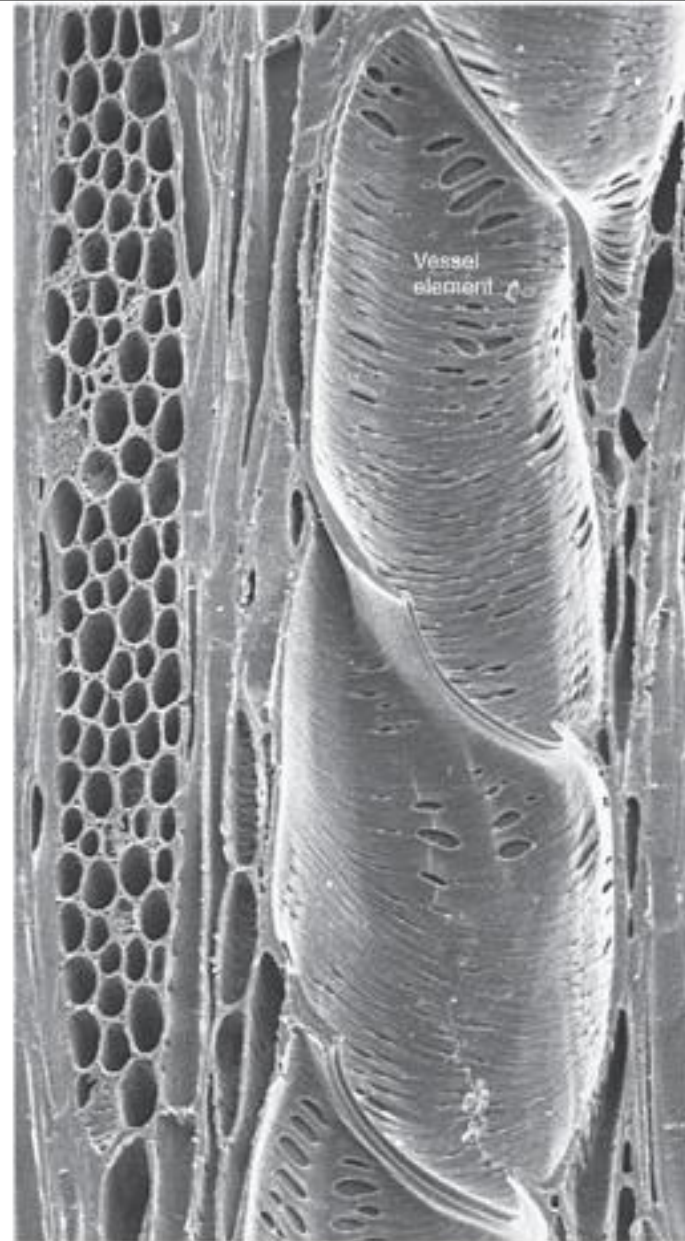


Transpiration – loss of water from the leaf surface  
Driving force for movement of water in xylem





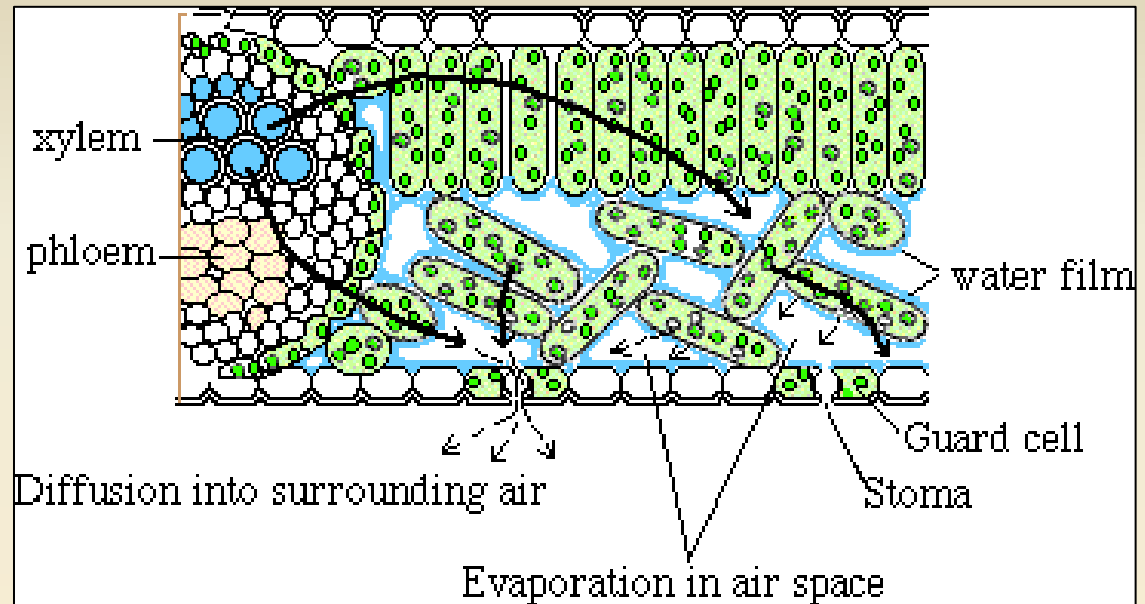
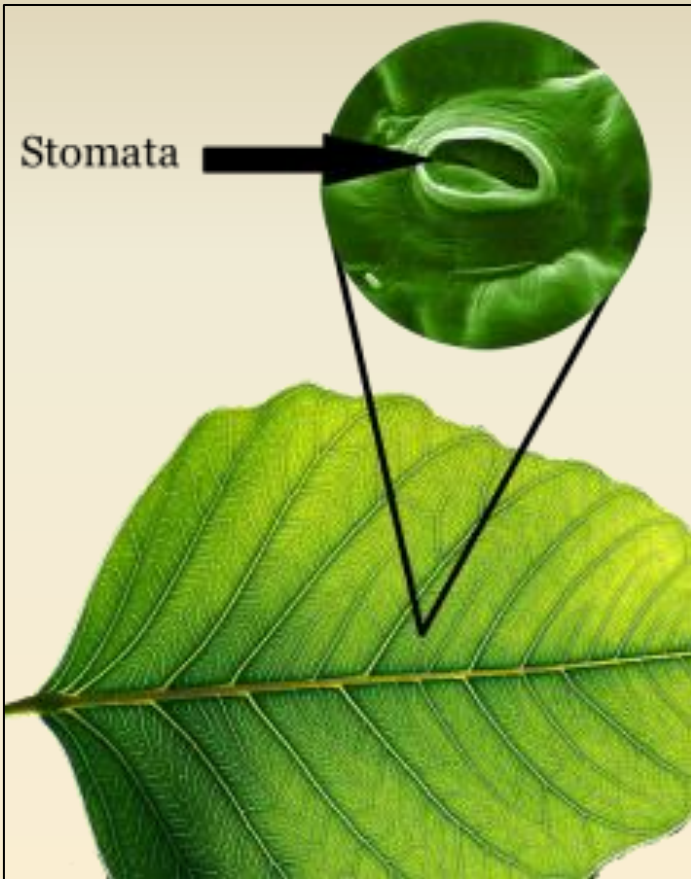
(a) Xylem transport



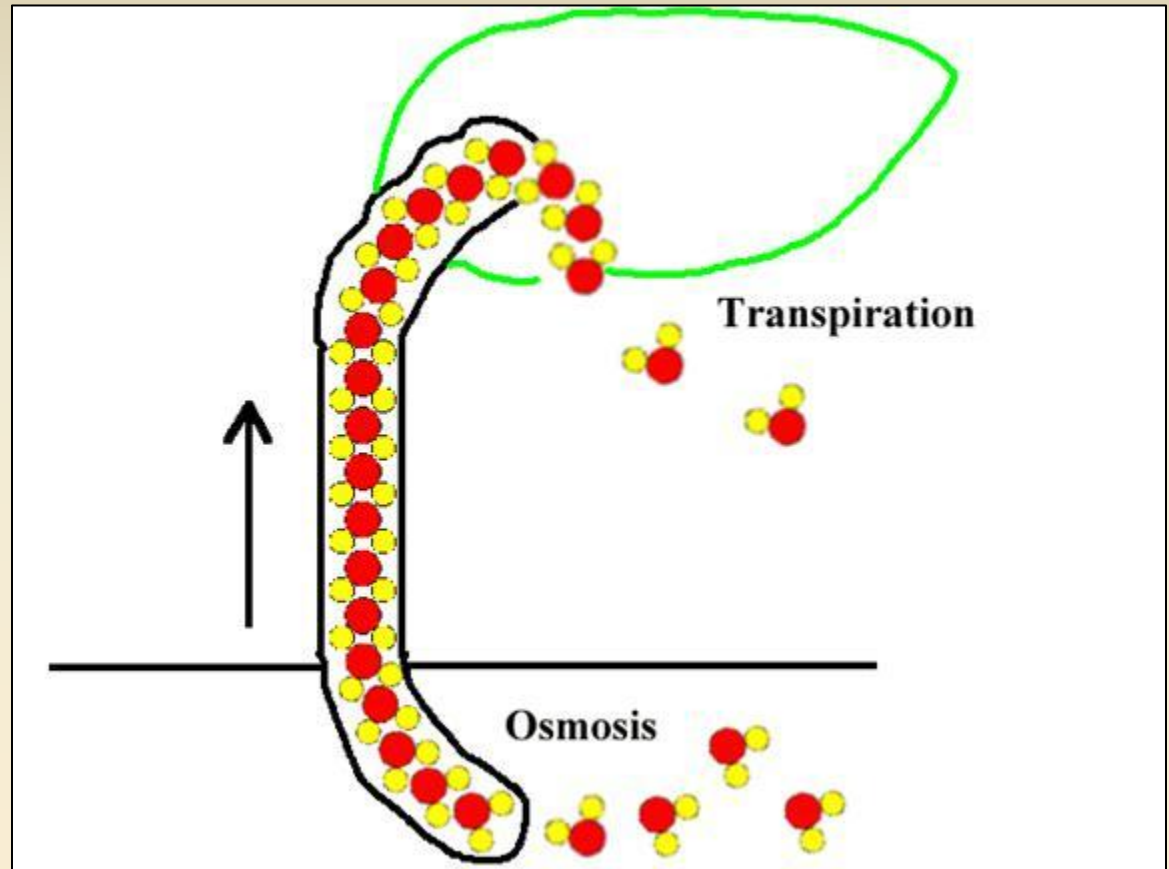
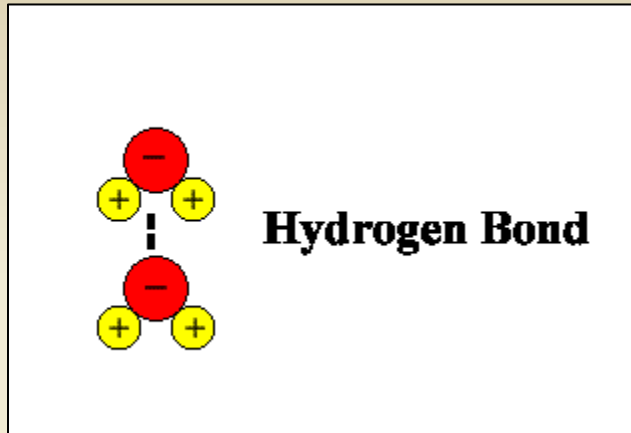
(b)

**Figure 4.1** Transpiration-Cohesion Theory of xylem transport. (a) As transpiration occurs in the leaf, it creates a cohesive pull on the whole water column downward to the roots, where water is absorbed from the soil. (b) Vessel elements join to form a long vessel that may reach from the roots to the stem tip.

# Diffusion and Evaporation of H<sub>2</sub>O from the leaf



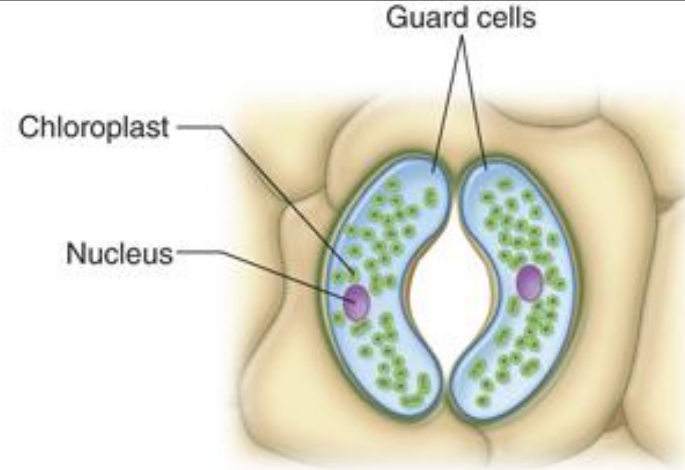
# Cohesion / Transpiration pull theory



Water is physically pulled upwards. This kind of transpiration pull on the column upwards creates a kind of tension on the water column.

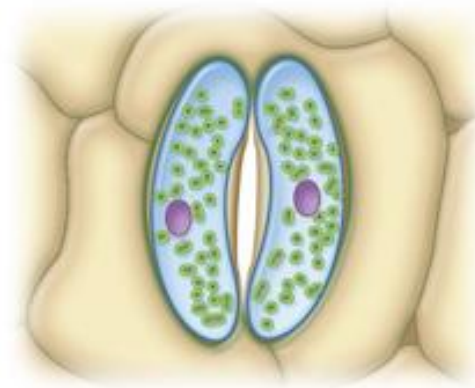


Guard cells can regulate rate of transpiration by opening and closing stomata



(a)

Open Stoma

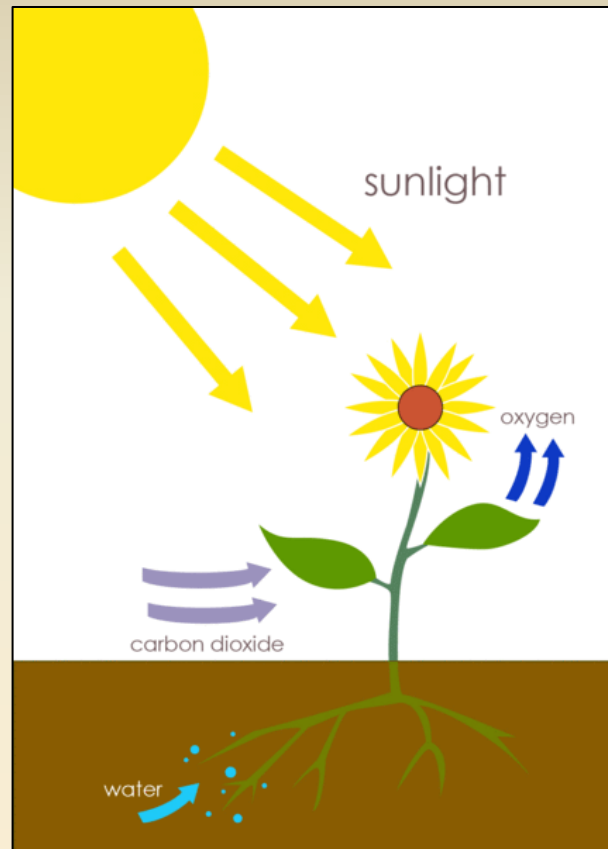


(b)

Closed Stoma

**Figure 4.2** Transpiration is the basic driving force behind water movement in the xylem. (a) When stomata are open, both transpiration and photosynthesis occur as  $H_2O$  molecules diffuse out of the leaves and  $CO_2$  molecules diffuse in. (b) When guard cells are turgid, stomata are open, and when guard cells are flaccid, stomata are closed.

# Photosynthesis



$6\text{CO}_2$   
Carbon dioxide

+

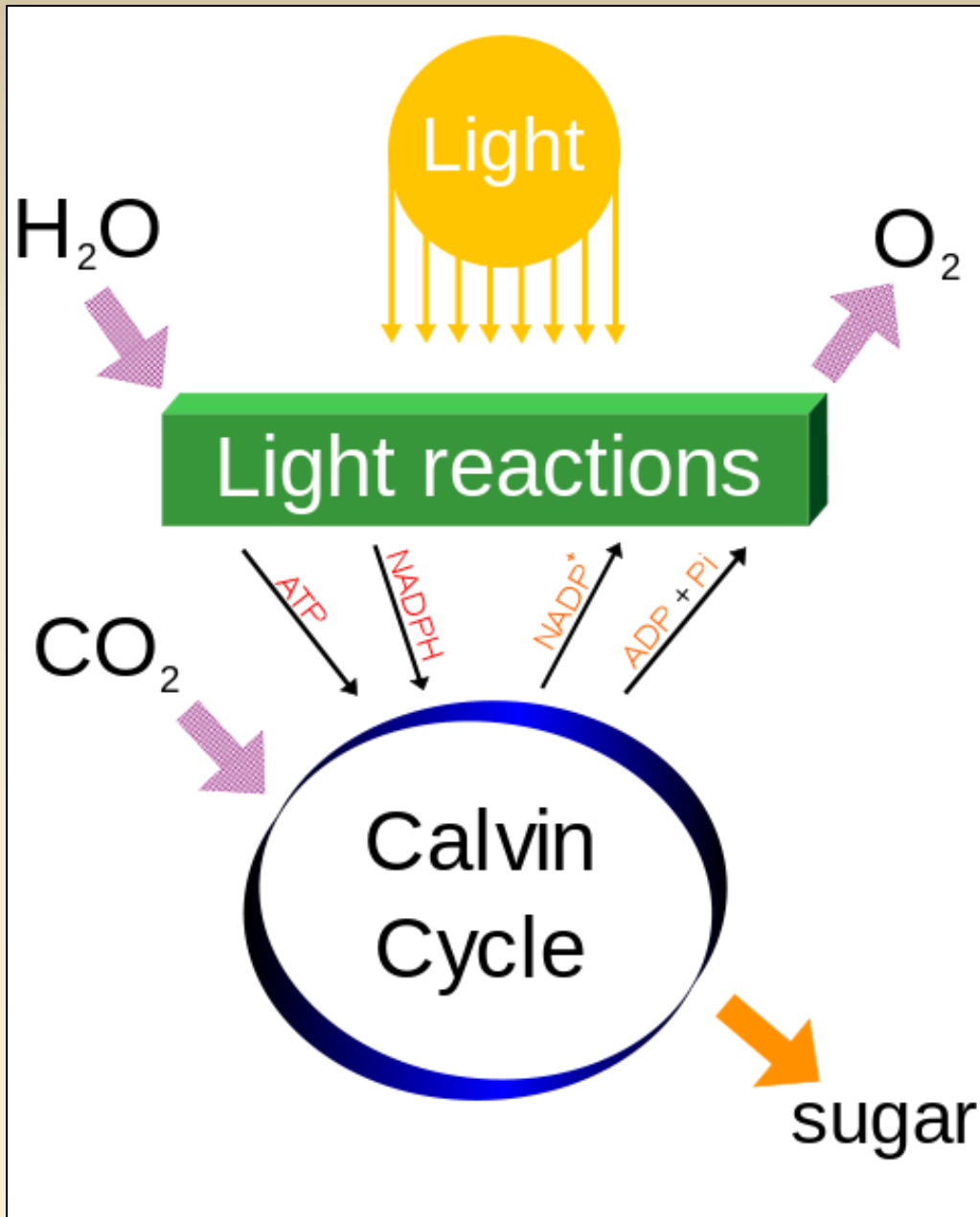
$6\text{H}_2\text{O}$   
Water

Light  
→

$\text{C}_6\text{H}_{12}\text{O}_6$   
Sugar

+

$6\text{O}_2$   
Oxygen

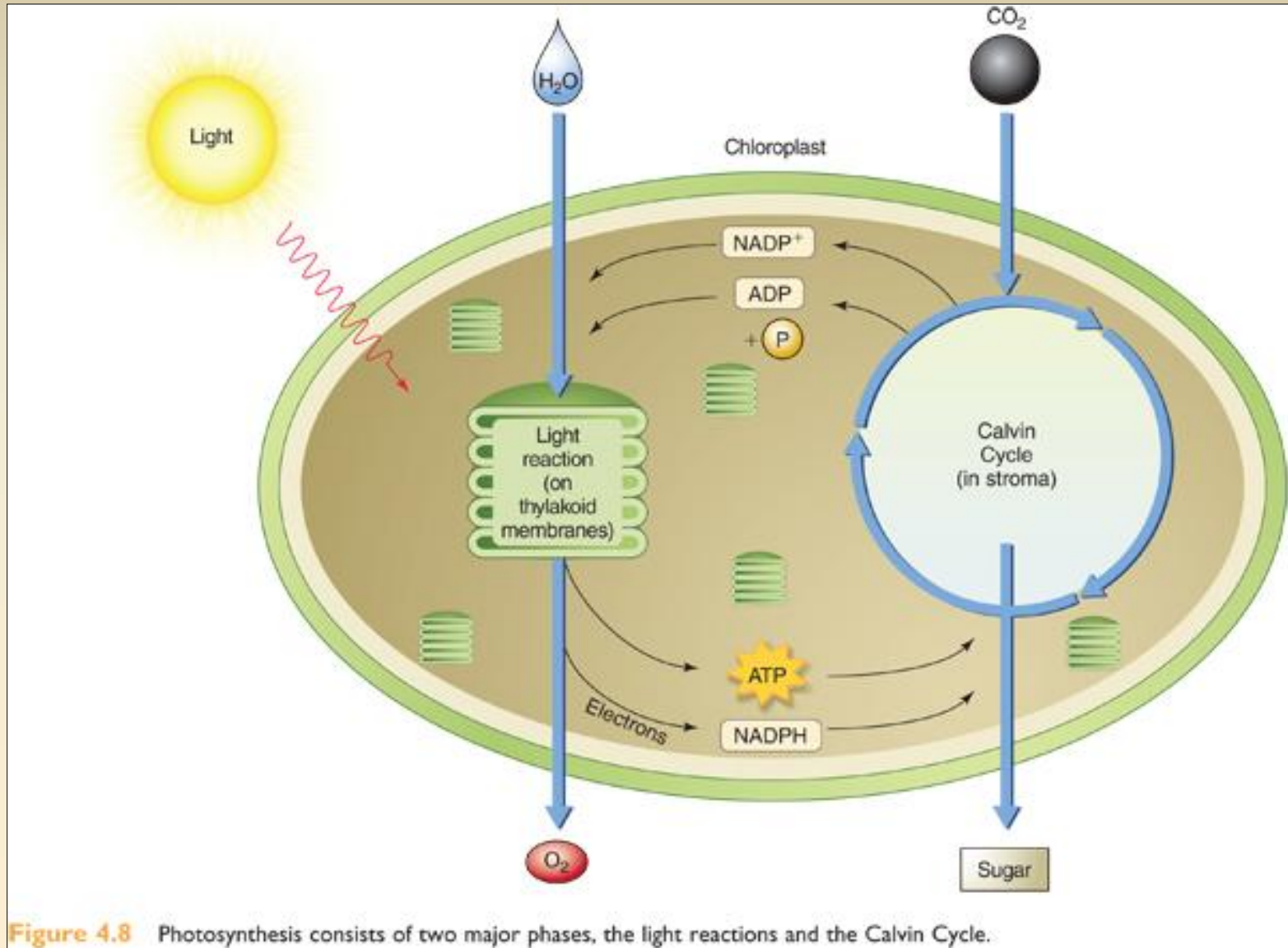


## Photosynthesis Overview

1. Light Reaction – capture light energy, convert to chemical energy
2. Calvin Cycle (Dark Reaction) – conversion of CO<sub>2</sub> to sugar



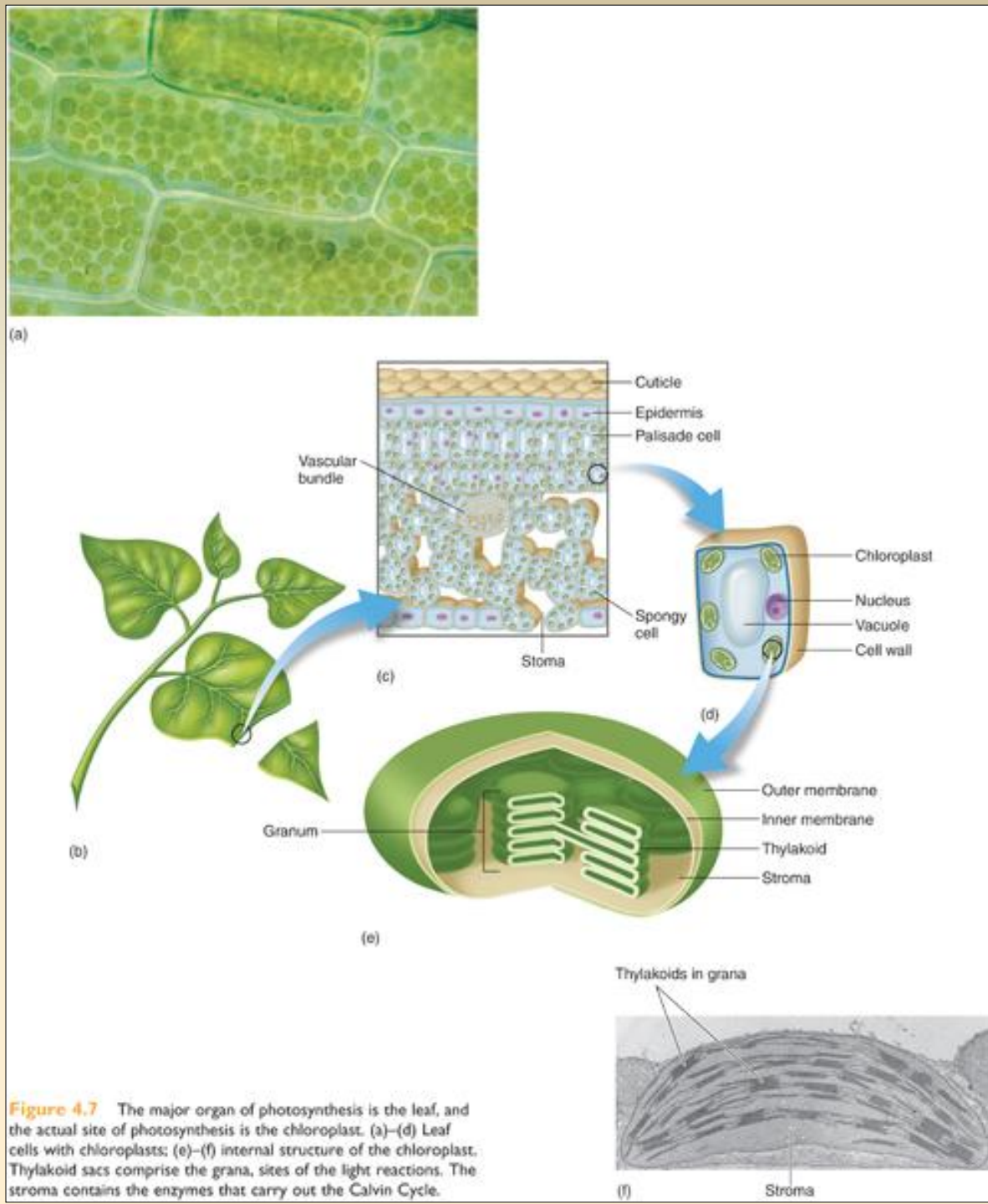
# Photosynthesis occurs in the chloroplast



**Figure 4.8** Photosynthesis consists of two major phases, the light reactions and the Calvin Cycle.

# 1. Light reaction

- Occurs in thylakoid membranes of chloroplast
- Capture of light energy by chlorophyll pigments



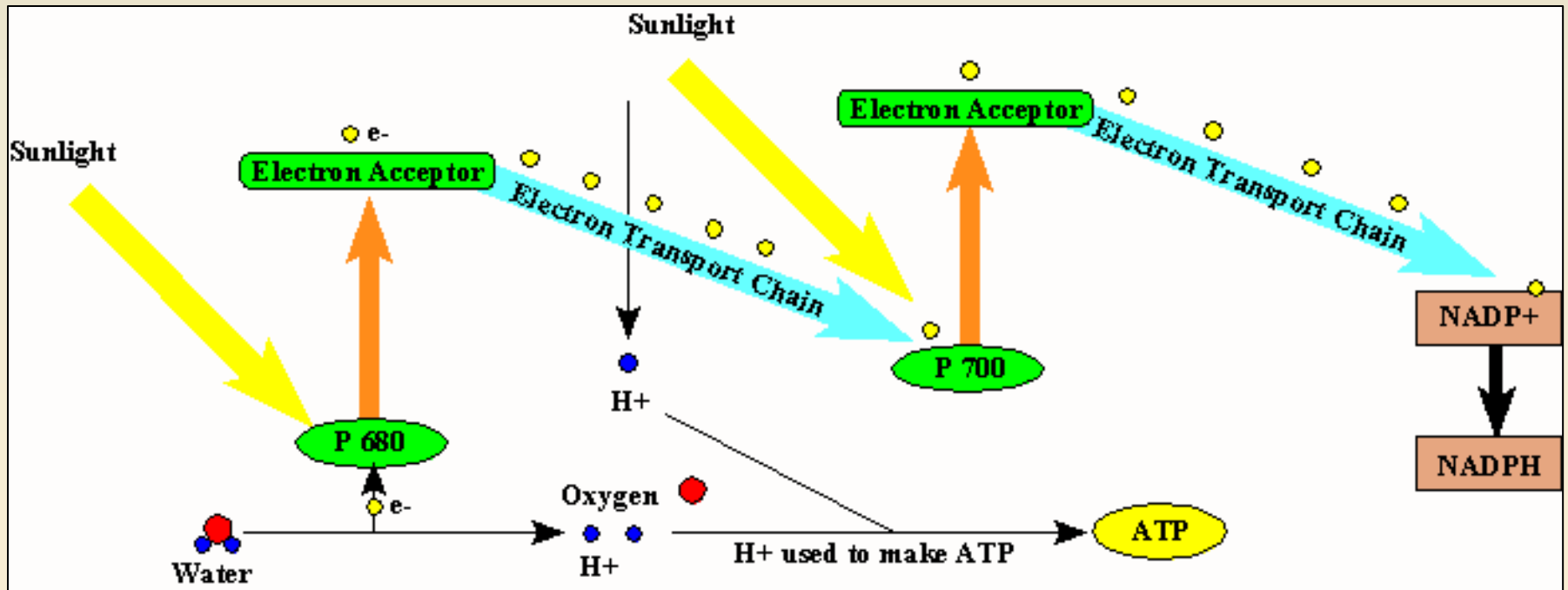
# Photosynthesis – Light reaction

Chlorophyll pigment absorbs a photon, gives up an electron

Electron passed through chain of carriers, producing ATP

Water molecule is split, releasing O<sub>2</sub> and electrons

NADP<sup>+</sup> converted to NADPH, energy rich compound used elsewhere

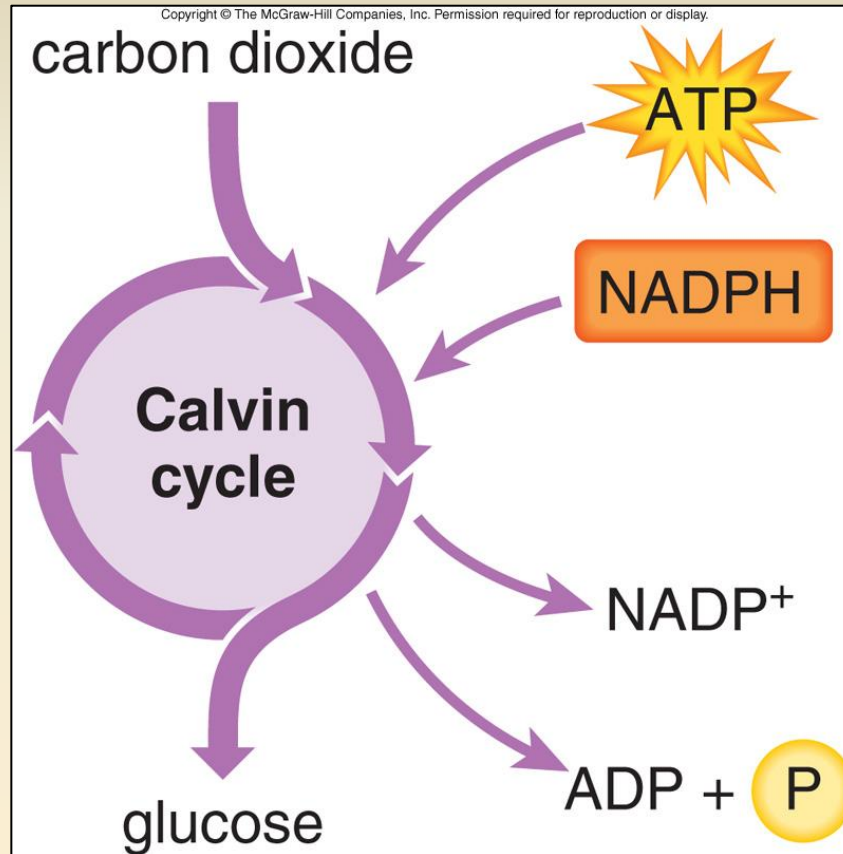


Light energy converted to chemical energy – ATP and NADPH

## 2. Calvin Cycle – CO<sub>2</sub> fixed to form sugars

Dark reaction, light independent

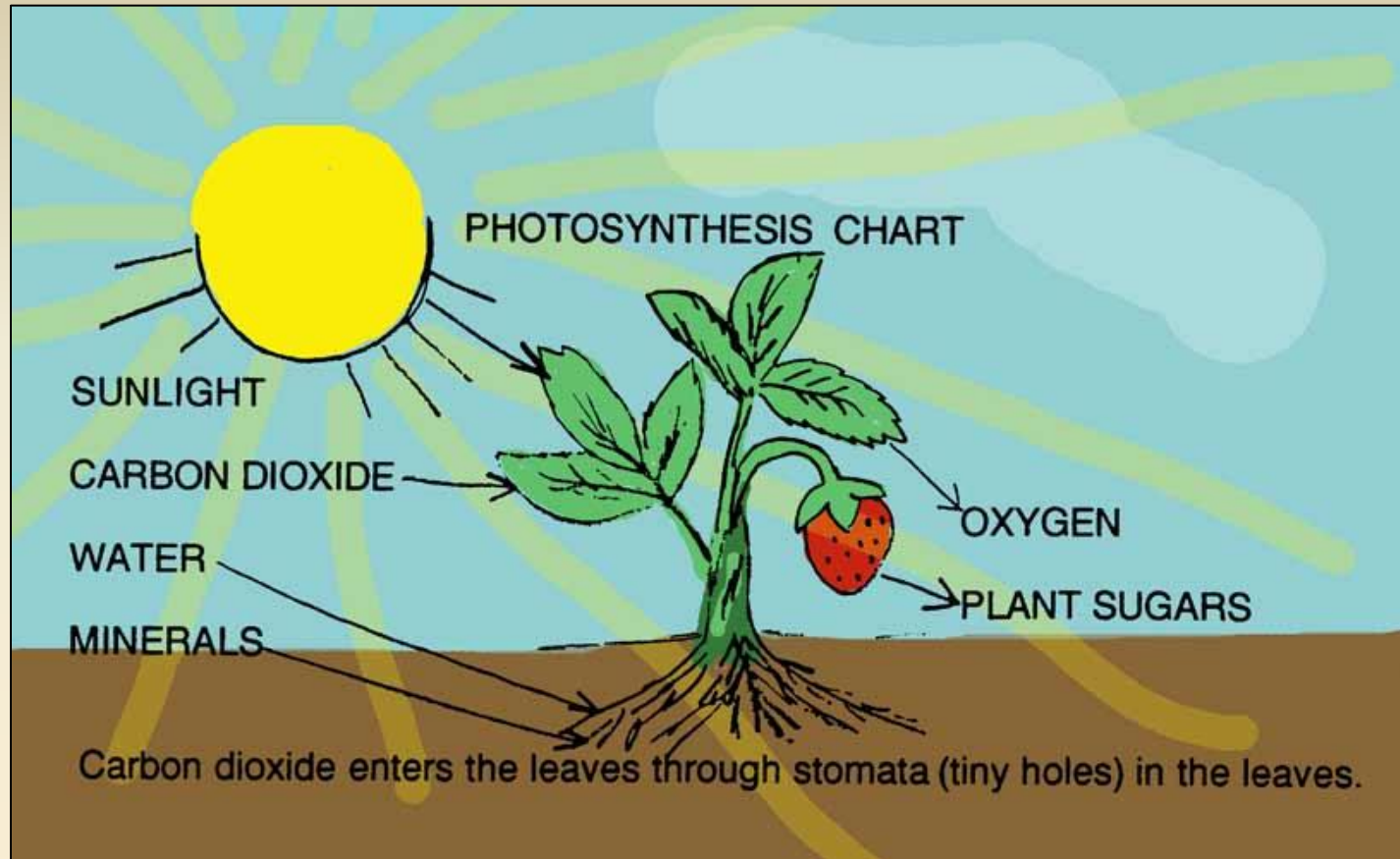
Takes place in the stroma of chloroplast



Energy from  
light  
reaction

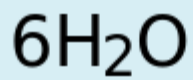
RUBISCO – ribulose-1, 5-bisphosphate carboxylase  
enzyme that fixes CO<sub>2</sub> to 5-carbon sugar

# Photosynthesis Summary



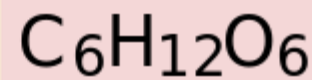
Carbon dioxide

+



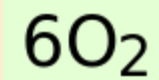
Water

Light  
→



Sugar

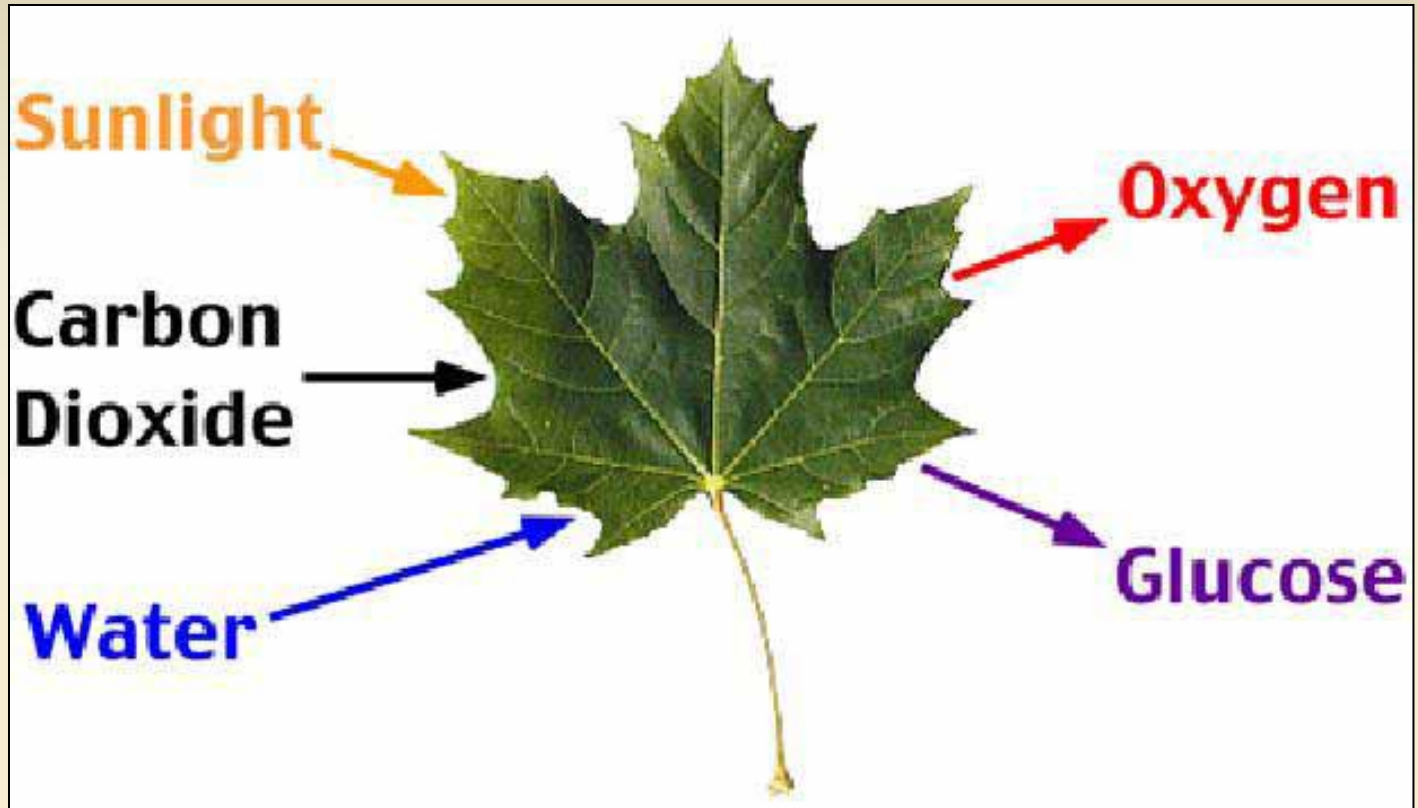
+



Oxygen



Know what goes in and what comes out.....



End