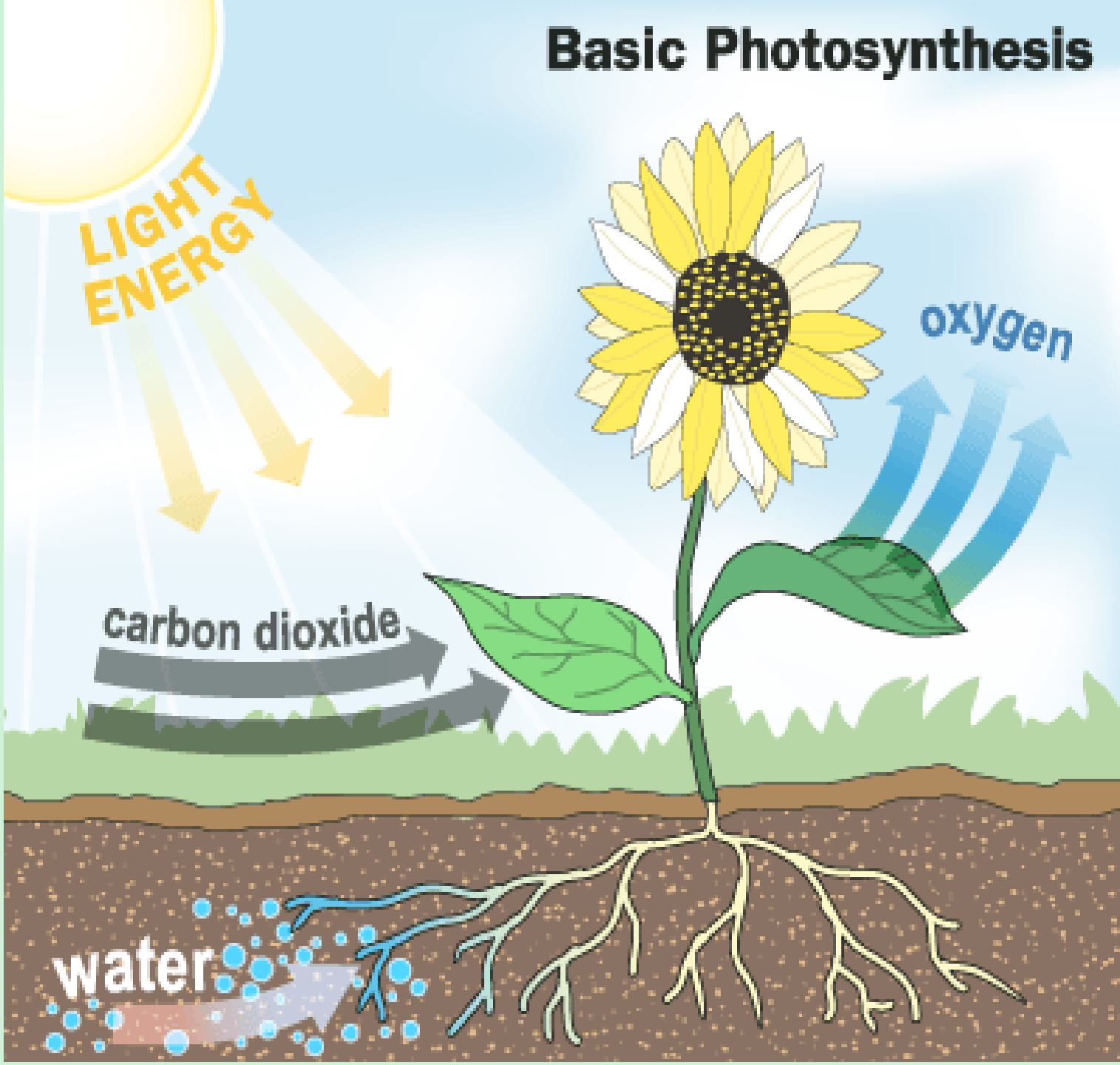


# Basic Photosynthesis



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# Heterotrophs and Autotrophs

All living organisms require nutrients in order to maintain normal bodily functions. Organisms can be classified based on the main way they obtain the nutrients they require for living. They can be classified into one of two groups:

- **Autotroph**: organisms produce their own organic compounds by photosynthesis
- **Heterotroph**: an organism that cannot synthesise organic compounds, but rather has to obtain them by eating other organisms.

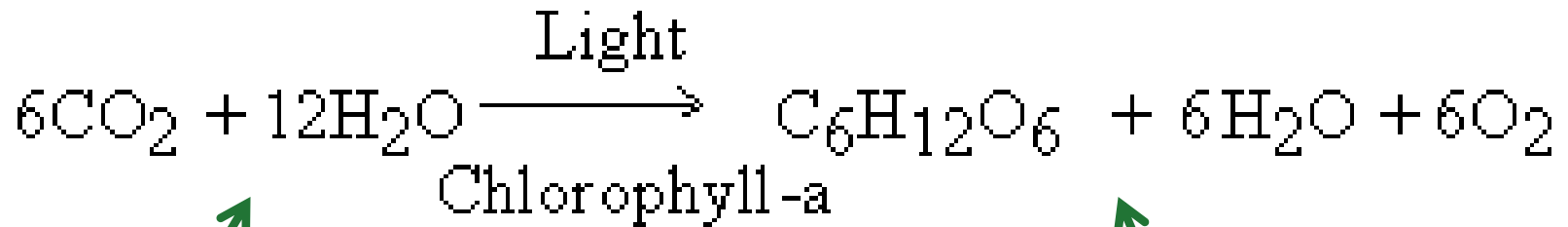


# Photosynthesis

Process whereby green plants convert (energy poor) inorganic compounds into (energy rich) organic compounds.

Stored as carbohydrate in their bodies.

# General Equation for Photosynthesis



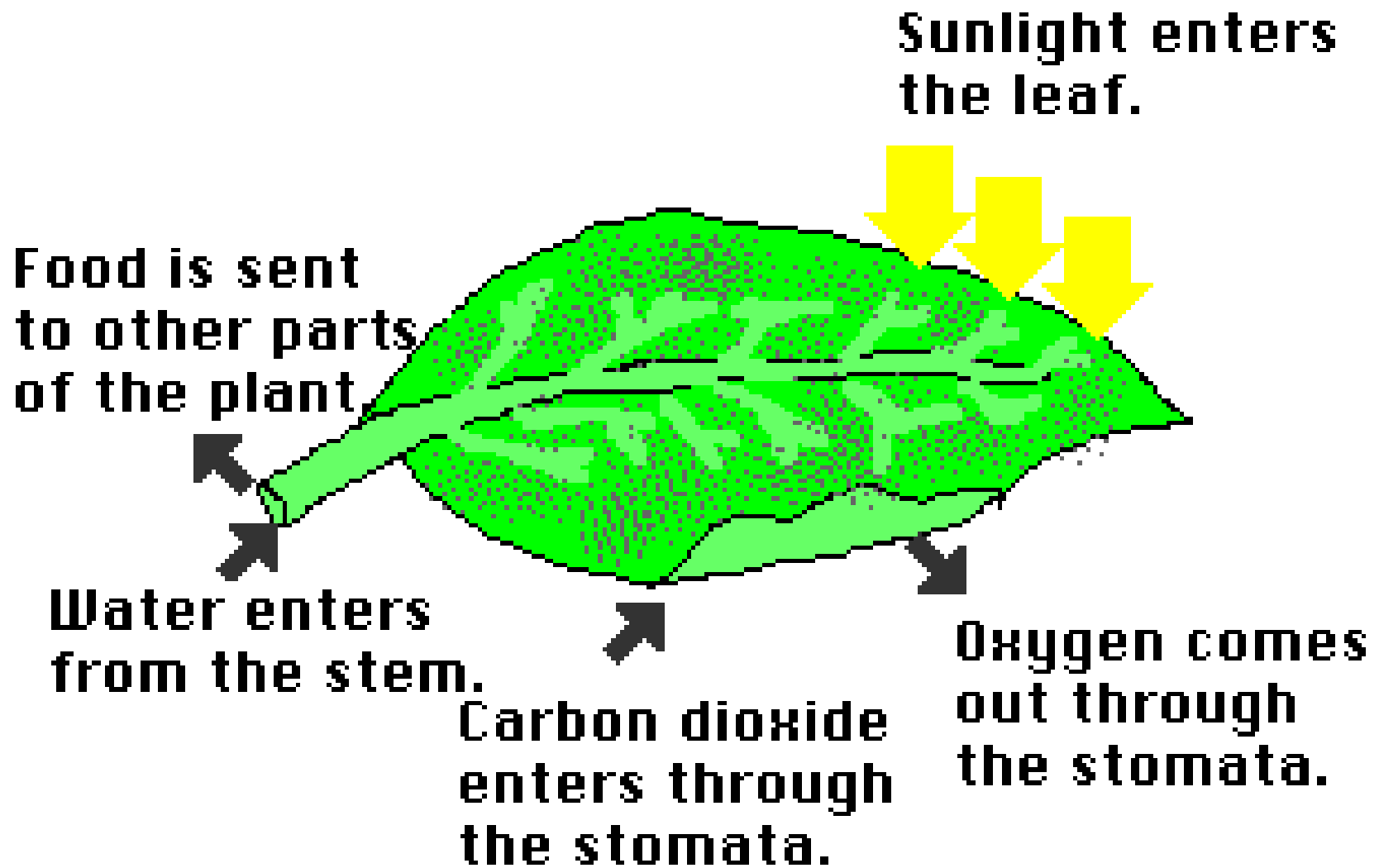
INPUTS

OUTPUTS

# What is the main plant organ that carries out photosynthesis??

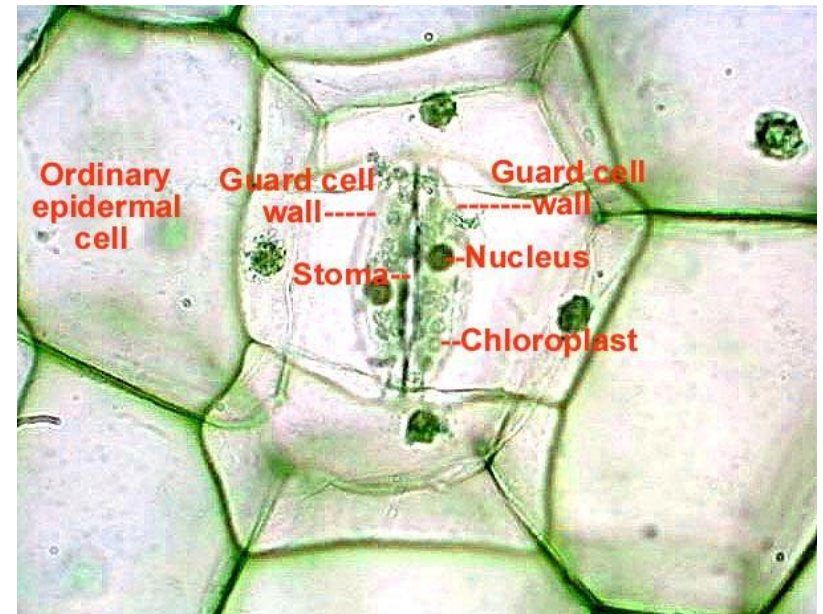
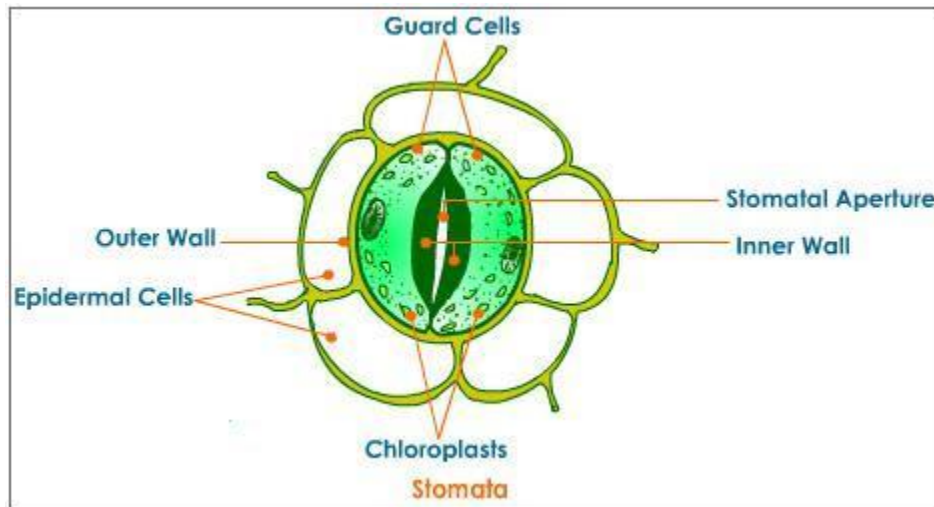


Answer: The Leaf



# How do gases enter and exit the cell?

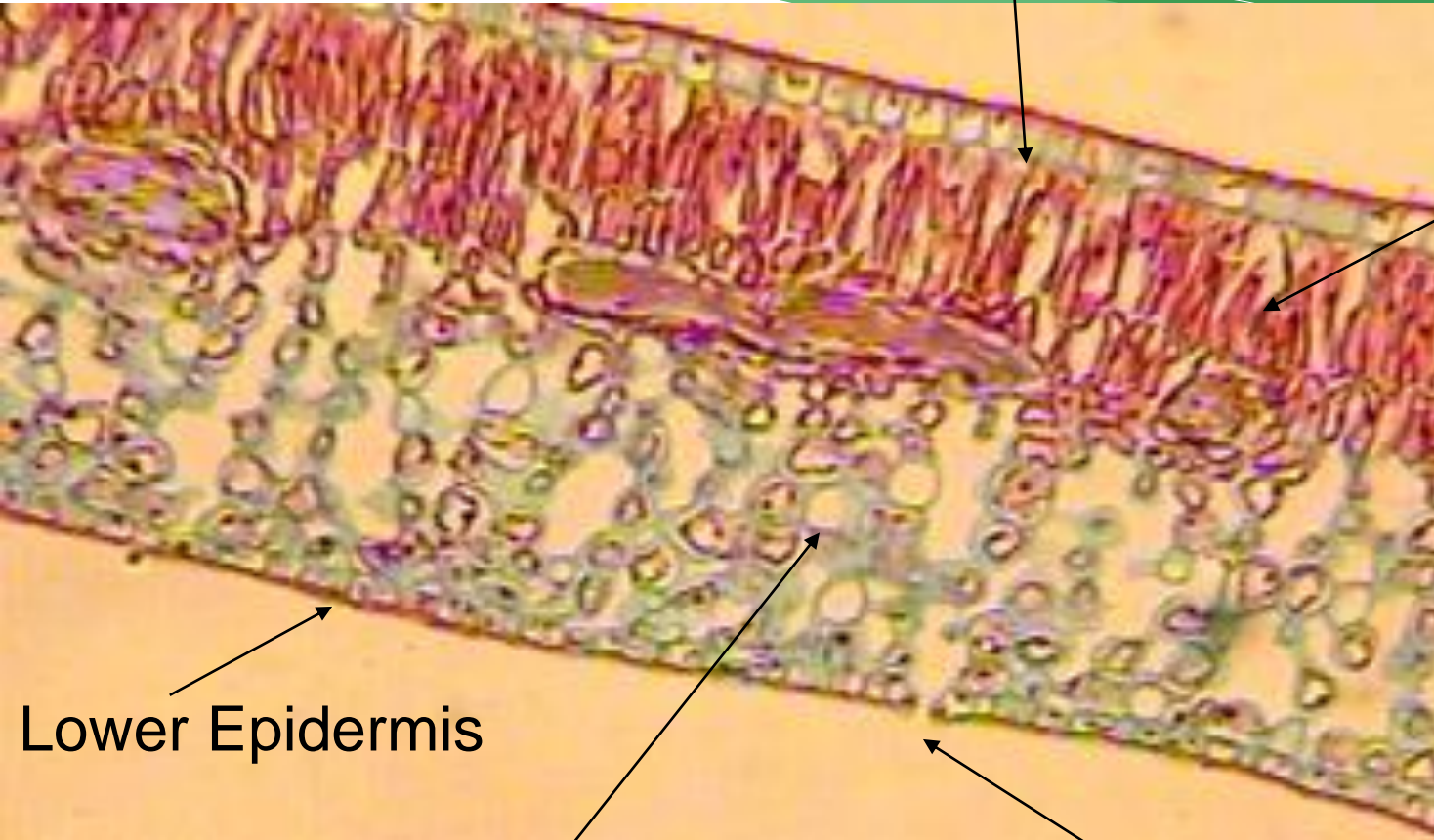
## Stomata



Activity- Stomata Prac



# Upper Epidermis



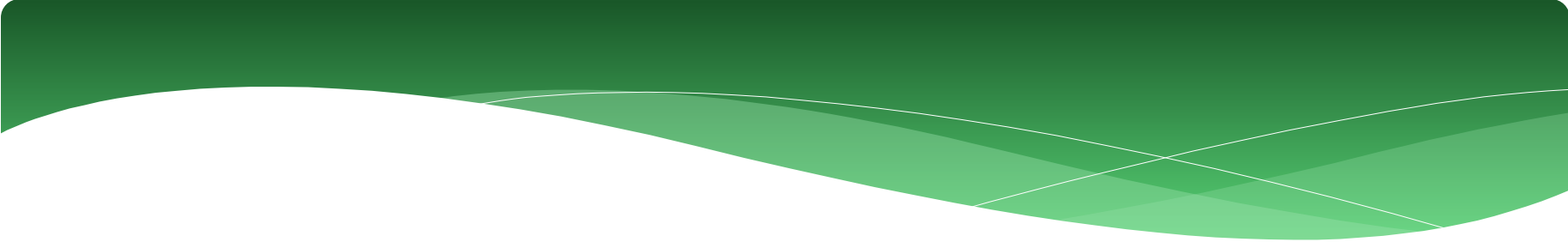
Palisade  
mesophyll

Lower Epidermis

Spongy  
mesophyll

Stoma with two  
guard cells





When the plant is well watered, the guard cells swell (become turgid) and the stoma opens to let in carbon dioxide.

This, however, lets water vapour escape from the leaf.

If the plant loses too much water vapour, the guard cells lose their turgidity and become flaccid.

This causes the stoma to close, preventing further water loss from the plant.

# Stoma (pore) open and closed

When there is a lot of water around or during the night, the guard cells will become turgid which makes the stomata open.

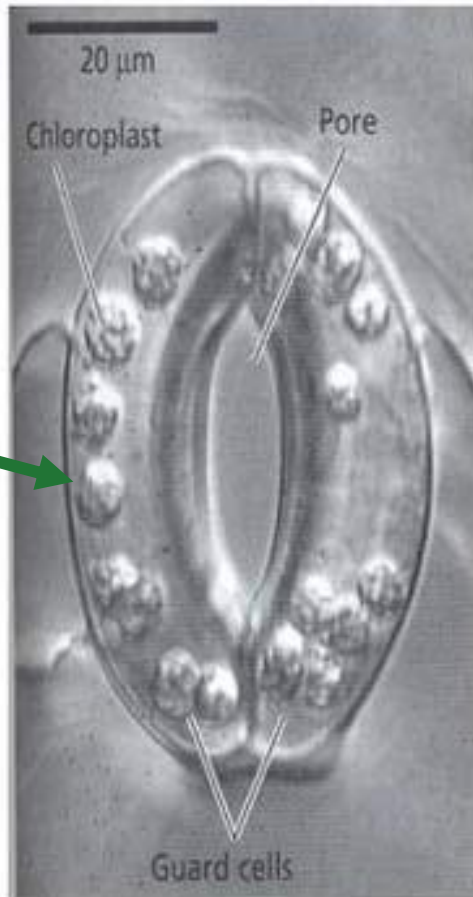


Image reproduced from Plant Physiology, Eds: L. Taiz and E. Zeiger, 2nd edition, Sinauer Associates, Inc. Publisher, Sunderland MA, USA. p. 523



When water is low, and the plant begins to wilt, the two guard cells are a bit flaccid. They soften and partially fill the gap between them.

When water is truly limited the guard cells are limp and the pore is closed blocking any further loss of water. However this also blocks taking up CO<sub>2</sub> and releasing O<sub>2</sub> slowing or stopping photosynthesis.

# Stomata on the undersurface of a leaf

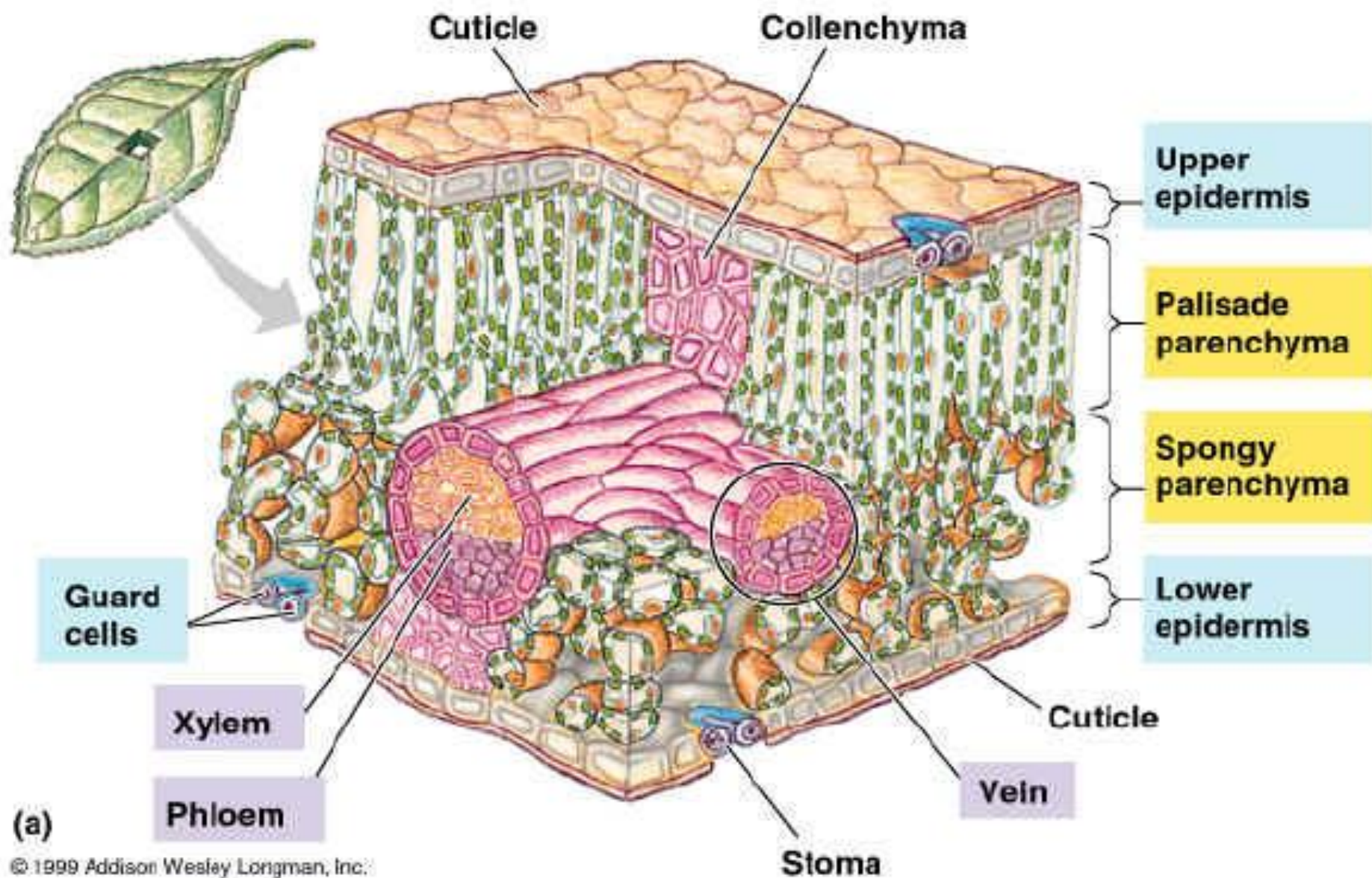




How does water travel to the leaf from the roots?

How does glucose travel from the leaf to other parts of the cell?







# Plant Transport Research Activity

*Areas you need to take notes on:*

- Basic plant structure
- What is xylem?
- What is phloem?
- Understand what transpiration is in relation to water and nutrient intake.
- Understand what translocation is in relation to food distribution.

Leaves are green  
because they contain  
the pigment:

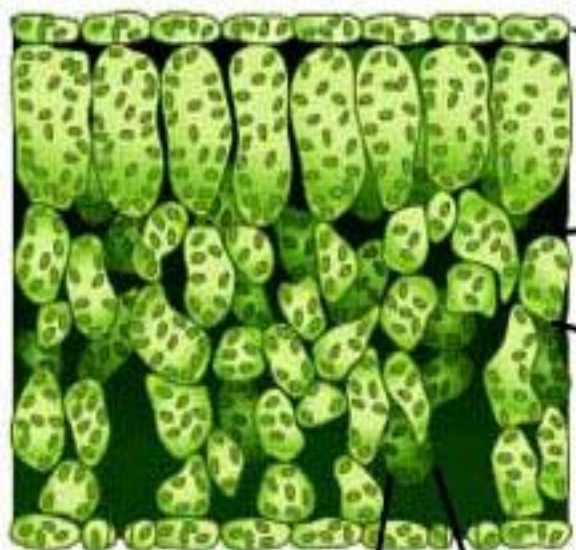
Leaves have a  
large surface  
area to absorb as  
much light as  
possible







How would this plant  
photosynthesise?



No chloroplasts  
in epidermis

Mesophyll cell



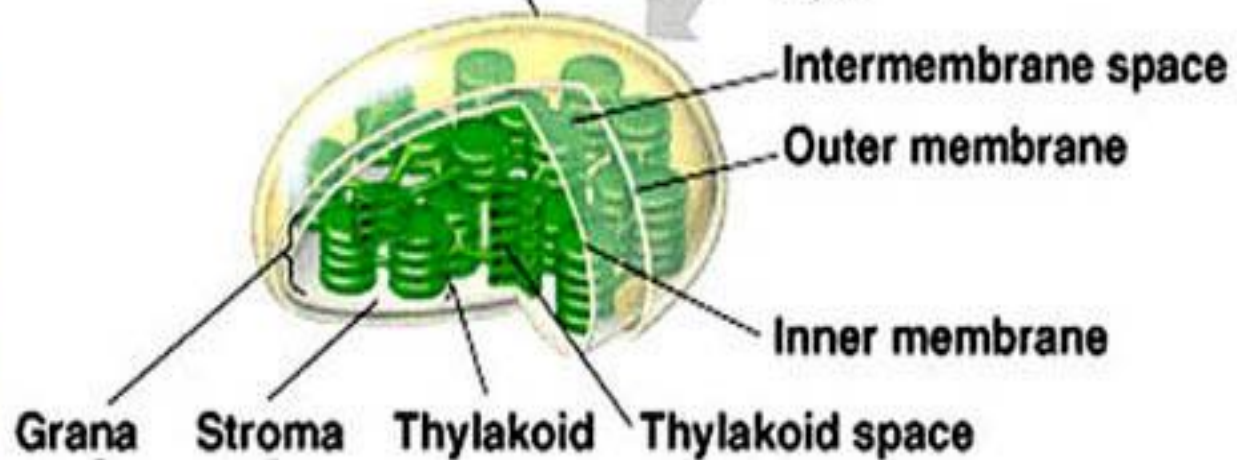
5 μm

Chloroplast

Leaf cross-section



Cells containing chloroplasts



Intermembrane space

Outer membrane

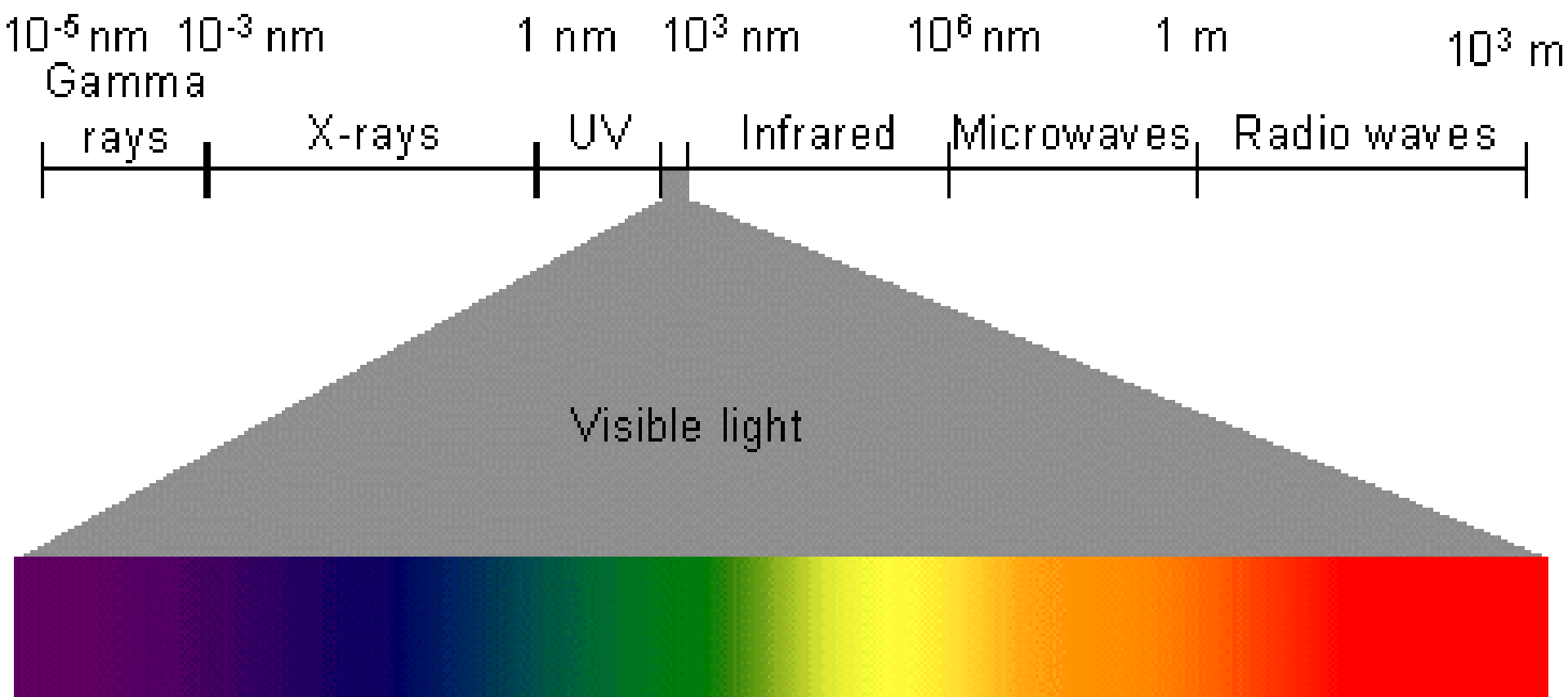
Inner membrane

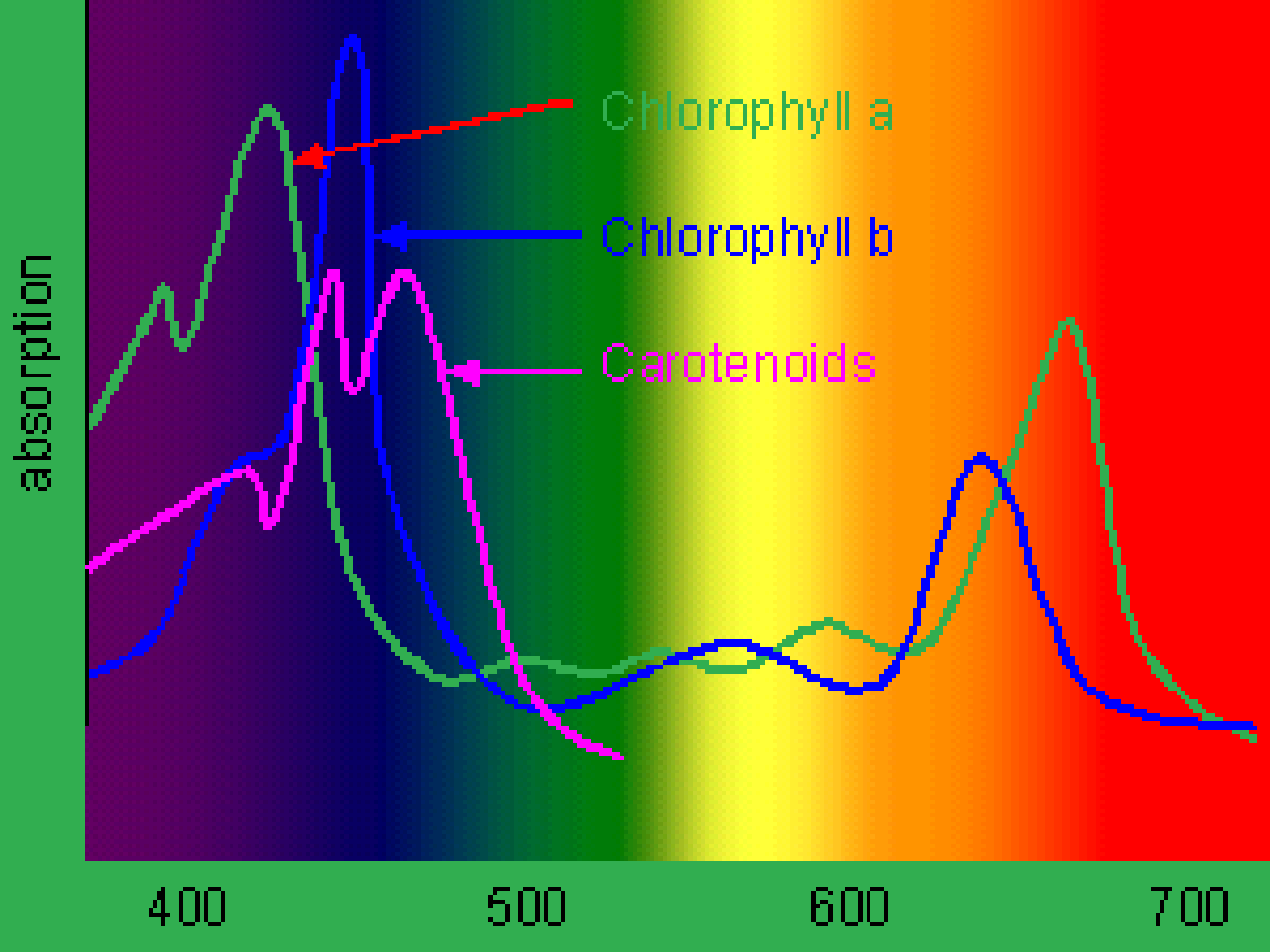
Grana

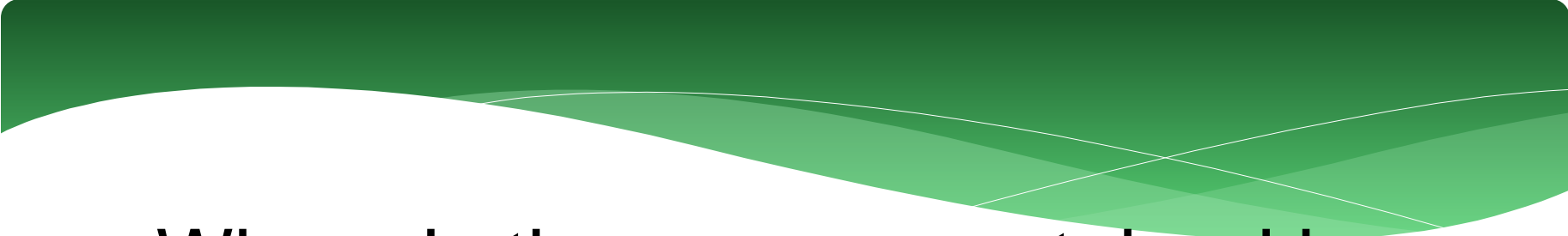
Stroma

Thylakoid

Thylakoid space





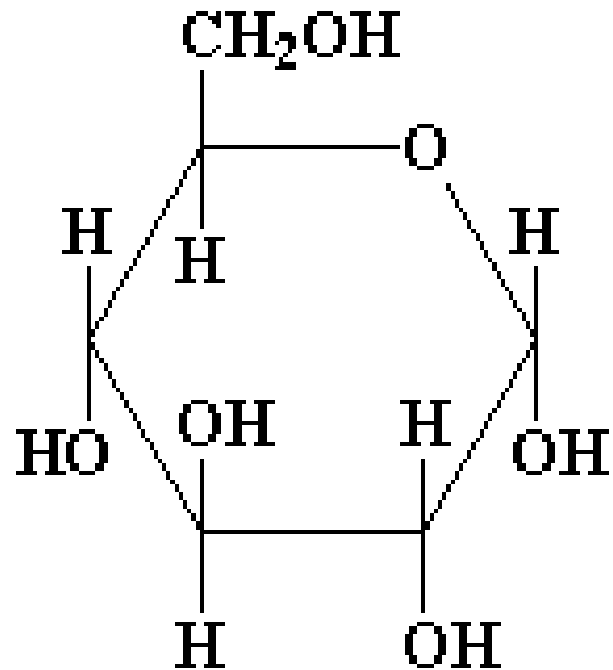


Where is the energy contained in  
organic compounds?

Answer????????????????

**Int hec hemicalb ondsh  
oldingt hea tomst ogether**

# What does this mean?



glucose

Where is the energy????



Where does photosynthesis occur?

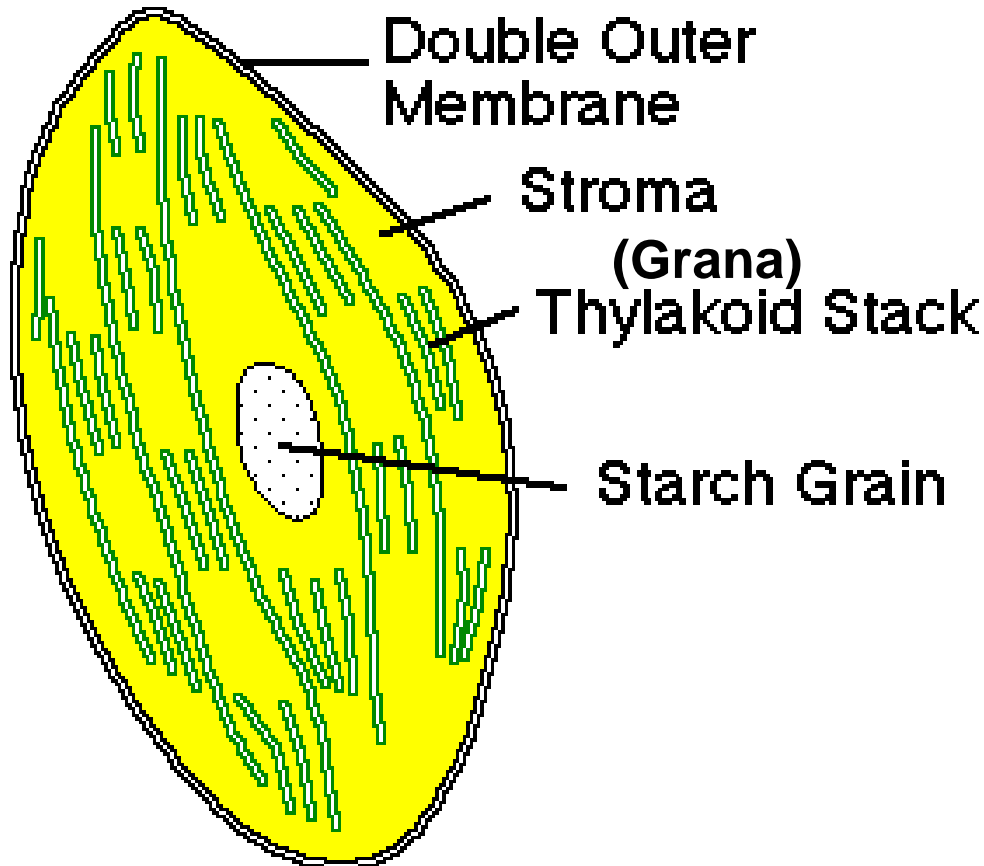


# Structure of a chloroplast

**Thylakoids: Disk shaped membranes containing photosynthetic pigments.**

**Grana:**

**Stroma:**



# What happens in the chloroplast?

Two main stages.

1. Light Dependent Reactions
2. Light Independent (Dark) Reactions



# Light Dependent Reactions

Occurs in the grana of the chloroplasts

Chlorophyll captures **sunlight energy** and transfers it to electrons. The electrons are “excited”.

# Light Dependent Reactions

involves two key parts

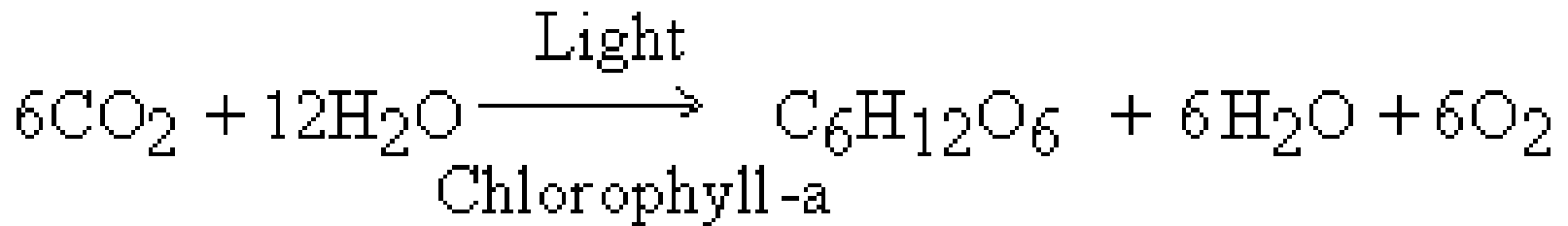
1. Splitting of water molecules into hydrogen and oxygen. This is called photolysis.
2. Electron Transport Chains. This is where energy captured from light is used to form ATP.

# Light Independent Reactions (Dark Reactions)

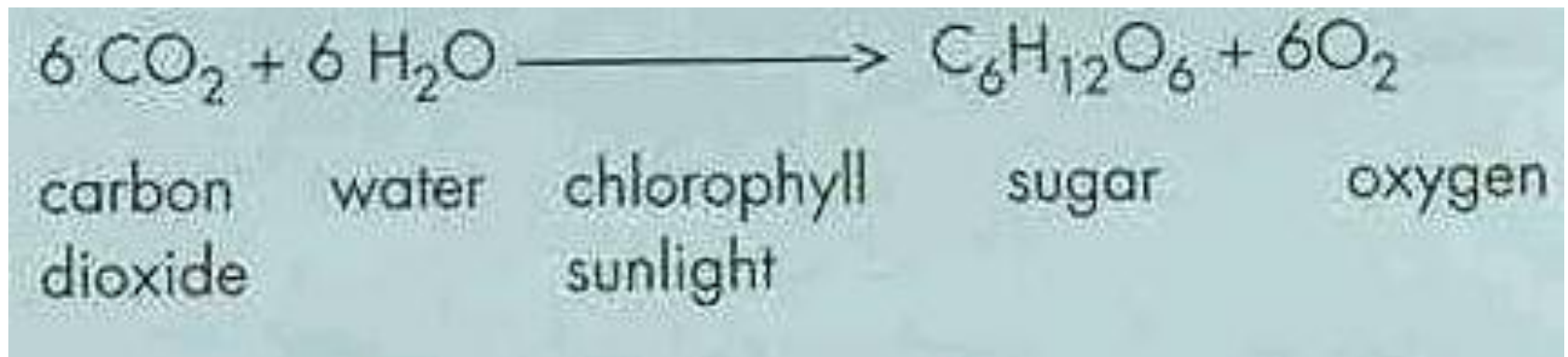
Enzymes in the stroma use the chemical energy of ATP to produce glucose.

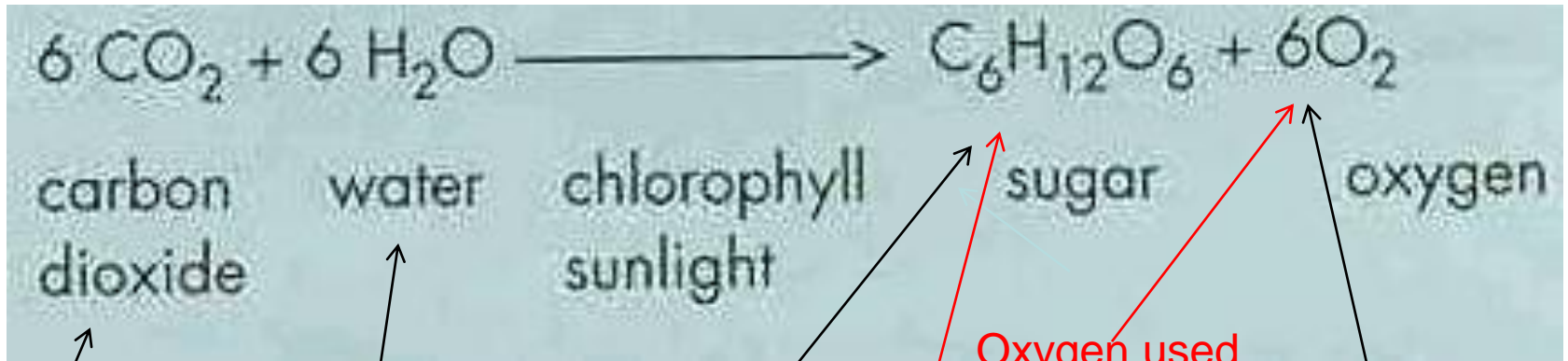
To do this, carbon dioxide is combined with hydrogen to produce glucose.

Do you remember this?



# Let's simplify it!





Carbon dioxide comes from the air and provides raw materials for production of glucose

Provides Hydrogen required in glucose

Oxygen in glucose comes from carbon dioxide

Glucose is used as a fuel for cellular respiration or to construct larger molecules such as cellulose, starch or disaccharide molecules such as fructose.

Oxygen used for aerobic respiration

Oxygen comes from the water



# How well did you understand?

\* <http://www.youtube.com/watch?v=pdgkuT12e14>

<http://www.youtube.com/watch?v=xRMKiLlpATk>

Watch and analyse these video's  
Biozone

Photosynthesis p 85

Factors Affecting photosynthesis p 88