

# Photosynthesis

**Amit Kumar, PhD**  
amit\_ndbr@wii.gov.in



भारतीय वन्यजीव संस्थान  
Wildlife Institute of India

# THE BASICS OF PHOTOSYNTHESIS

- Almost all plants are photosynthetic autotrophs, as are some bacteria and protists
  - Autotrophs generate their own organic matter through photosynthesis
  - Sunlight energy is transformed to energy stored in the form of chemical bonds

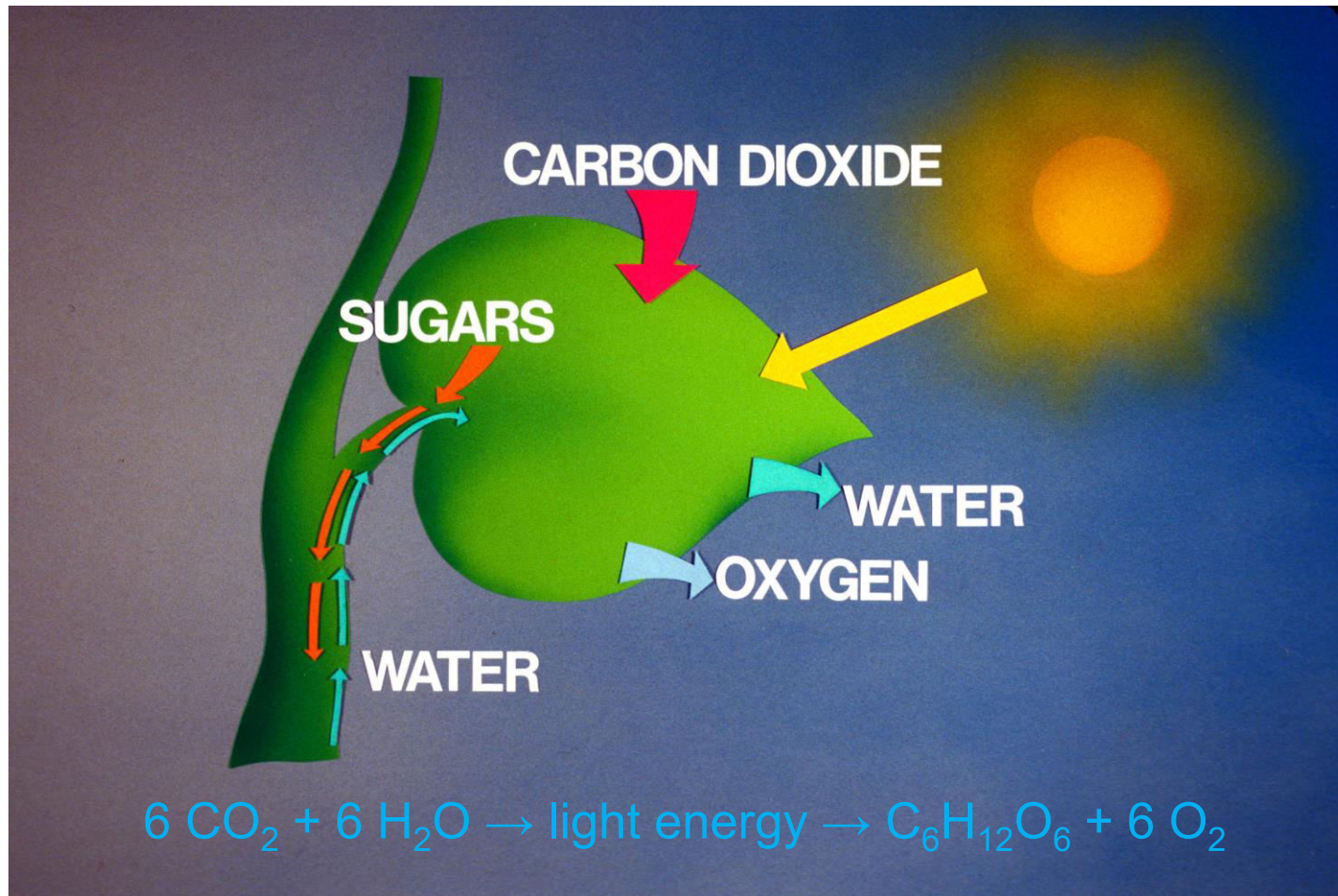


**Mosses, ferns, and  
flowering plants**



**Cyanobacteria**

# Light Energy Harvested by Plants & Other Photosynthetic Autotrophs



# Why is Photosynthesis important?

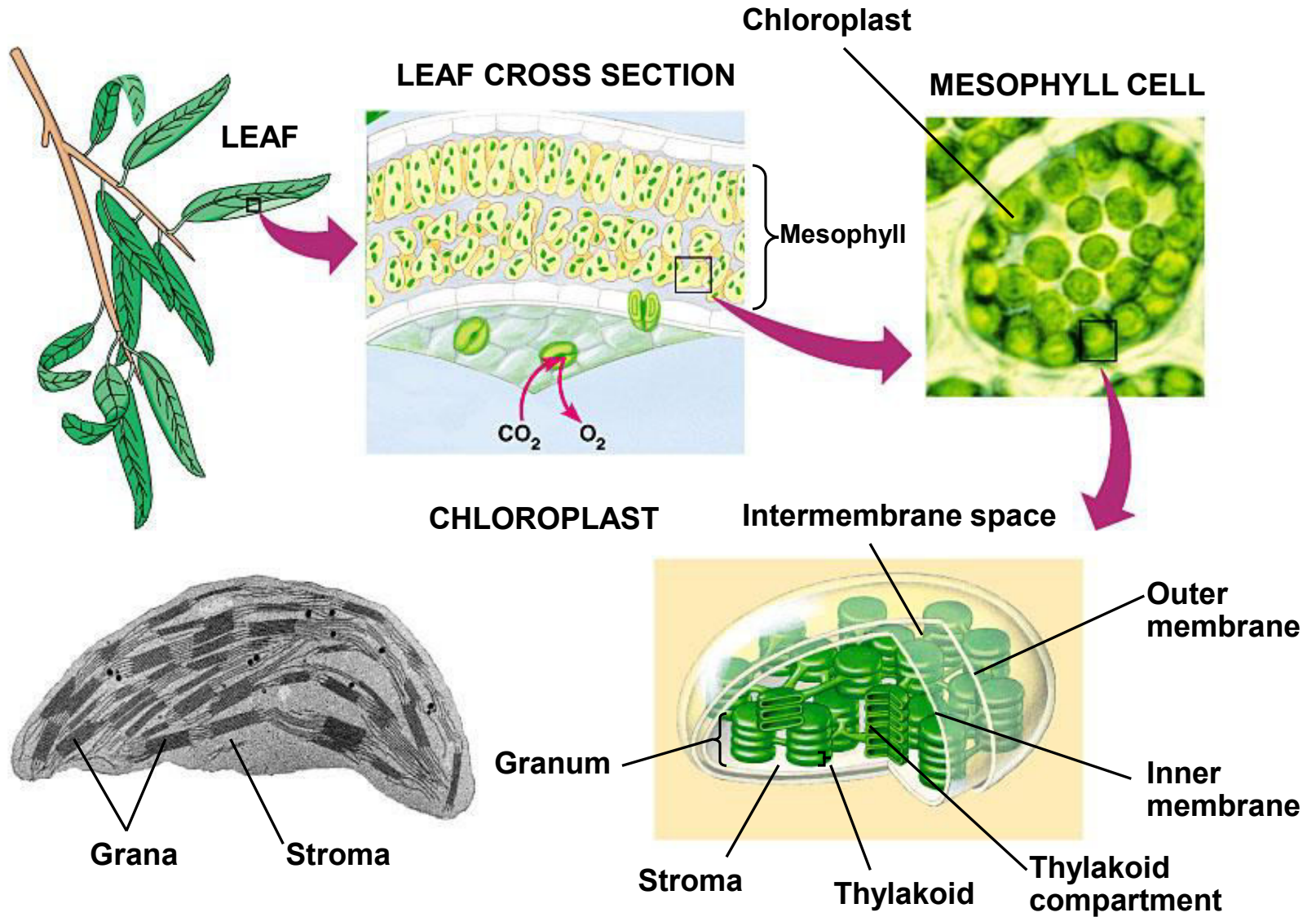
- Makes organic molecules out of inorganic materials.
- It begins all food chains & webs. All life is supported by this process.
- It also makes oxygen gas!



# Photosynthesis occurs in chloroplasts

- In most plants, photosynthesis occurs primarily in the leaves, in the chloroplasts
- A chloroplast contains:
  - stroma, a fluid
  - grana, stacks of thylakoids
- The thylakoids contain chlorophyll
  - Chlorophyll is the green pigment that captures light for photosynthesis

- The location and structure of chloroplasts

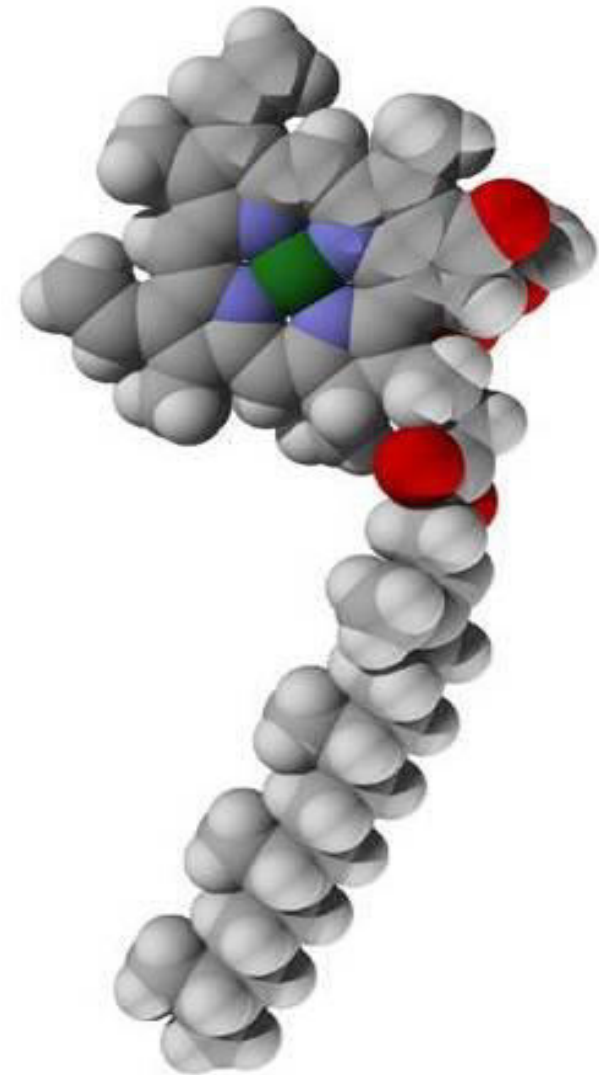
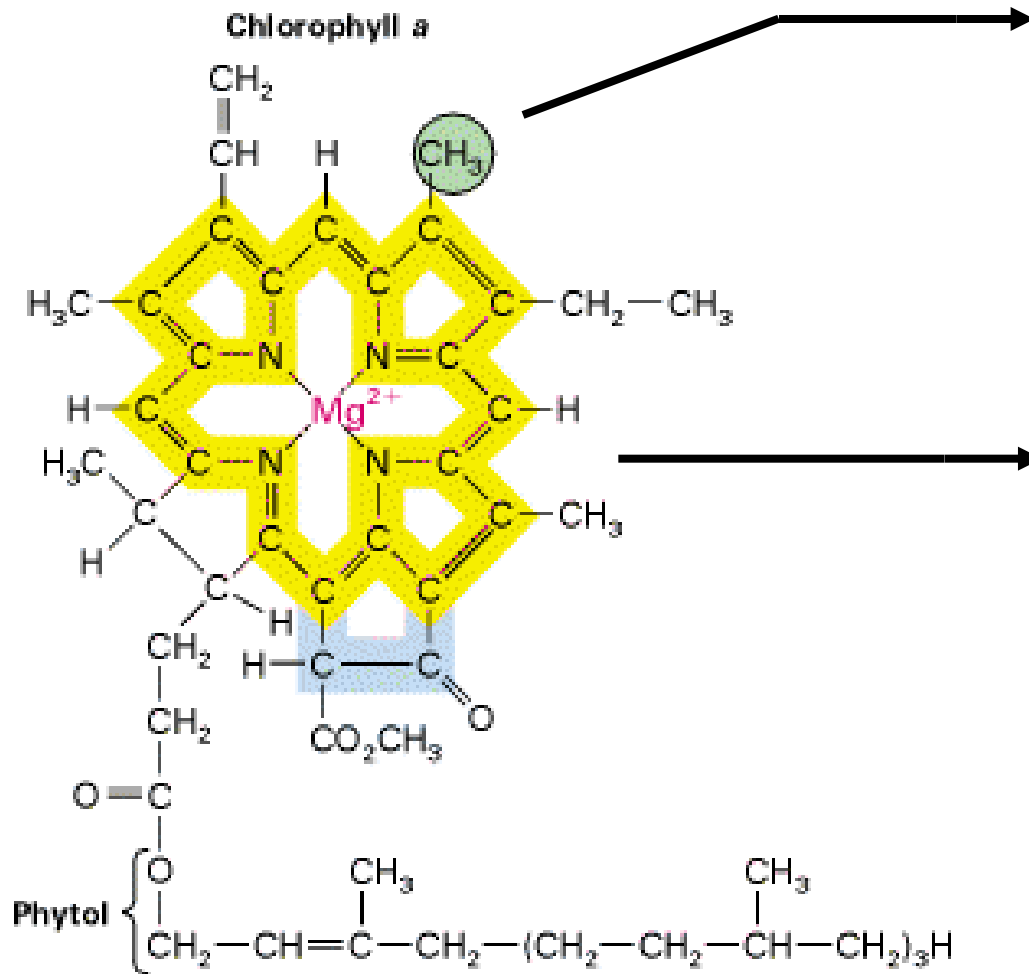


# Chloroplast Pigments

- Chloroplasts contain several pigments
  - Chlorophyll a
  - Chlorophyll b
  - Carotenoids
  - Xanthophyll



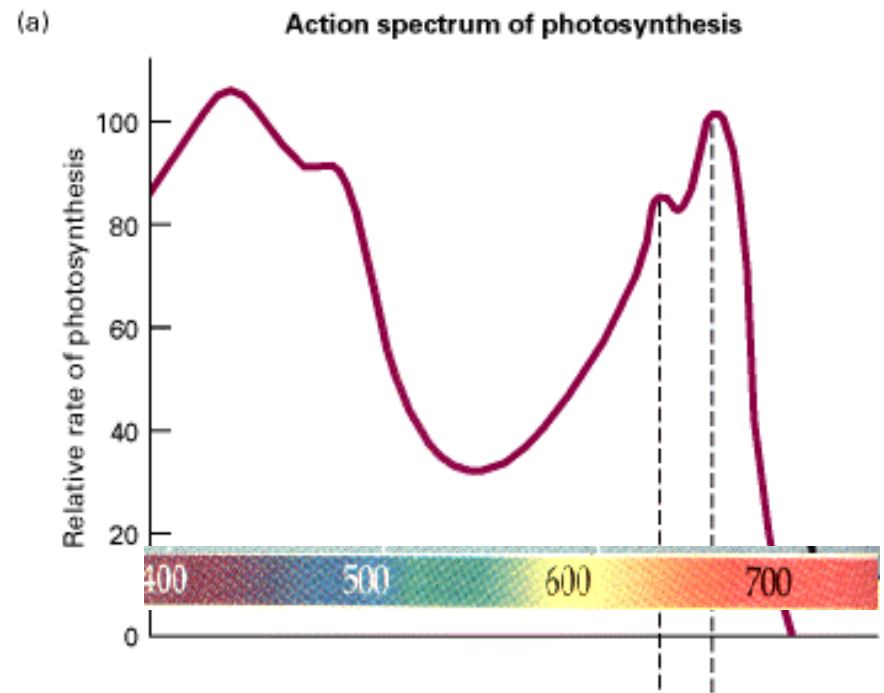
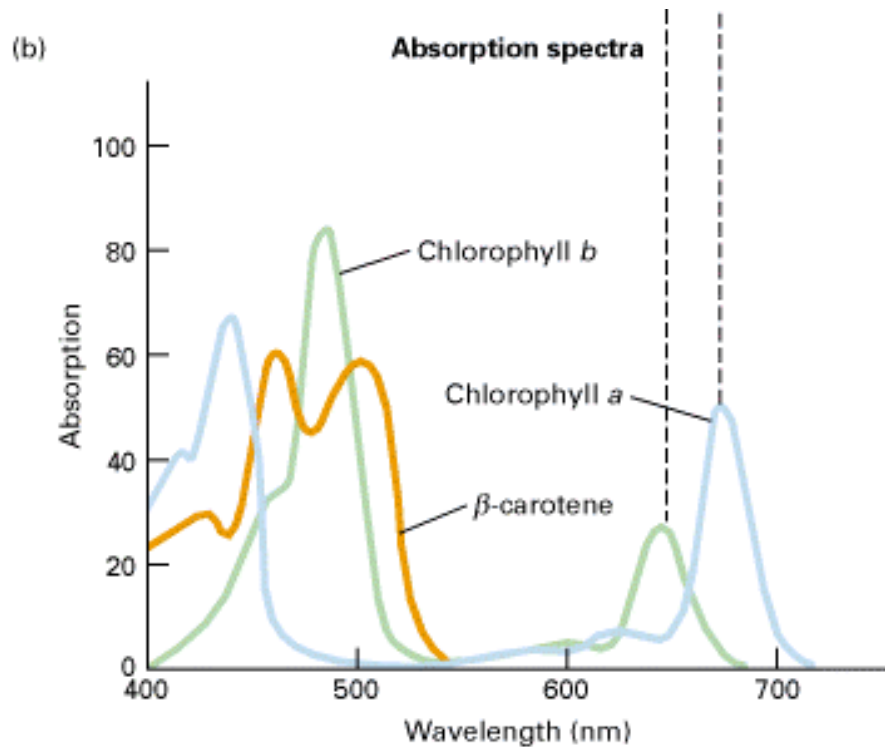
# Chlorophyll a & b



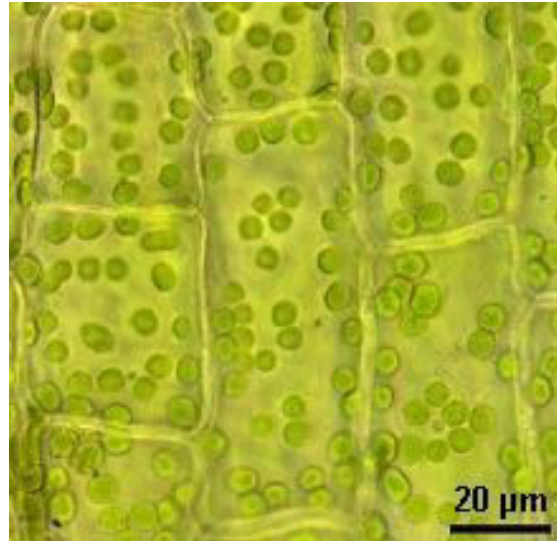
Phytol tail



# Different pigments absorb light differently

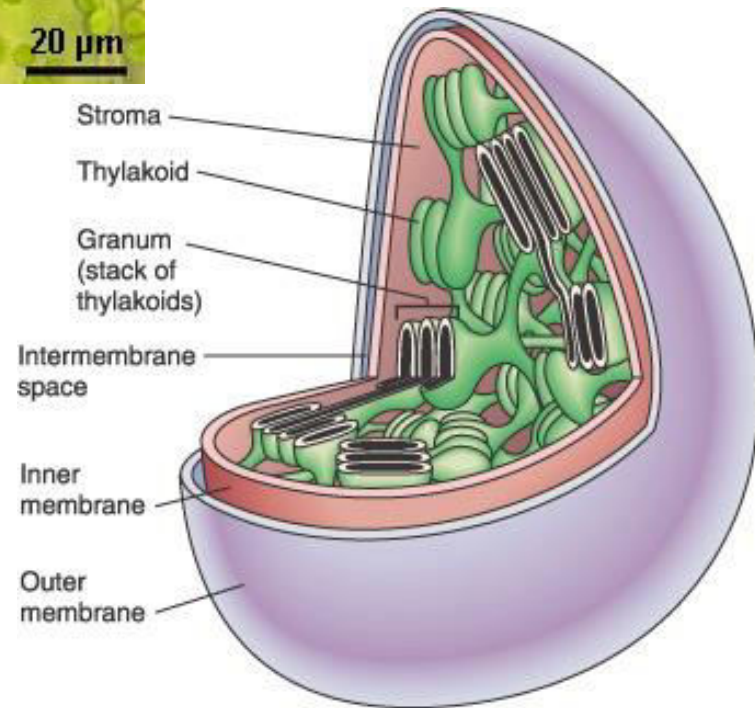


# WHY ARE PLANTS GREEN?



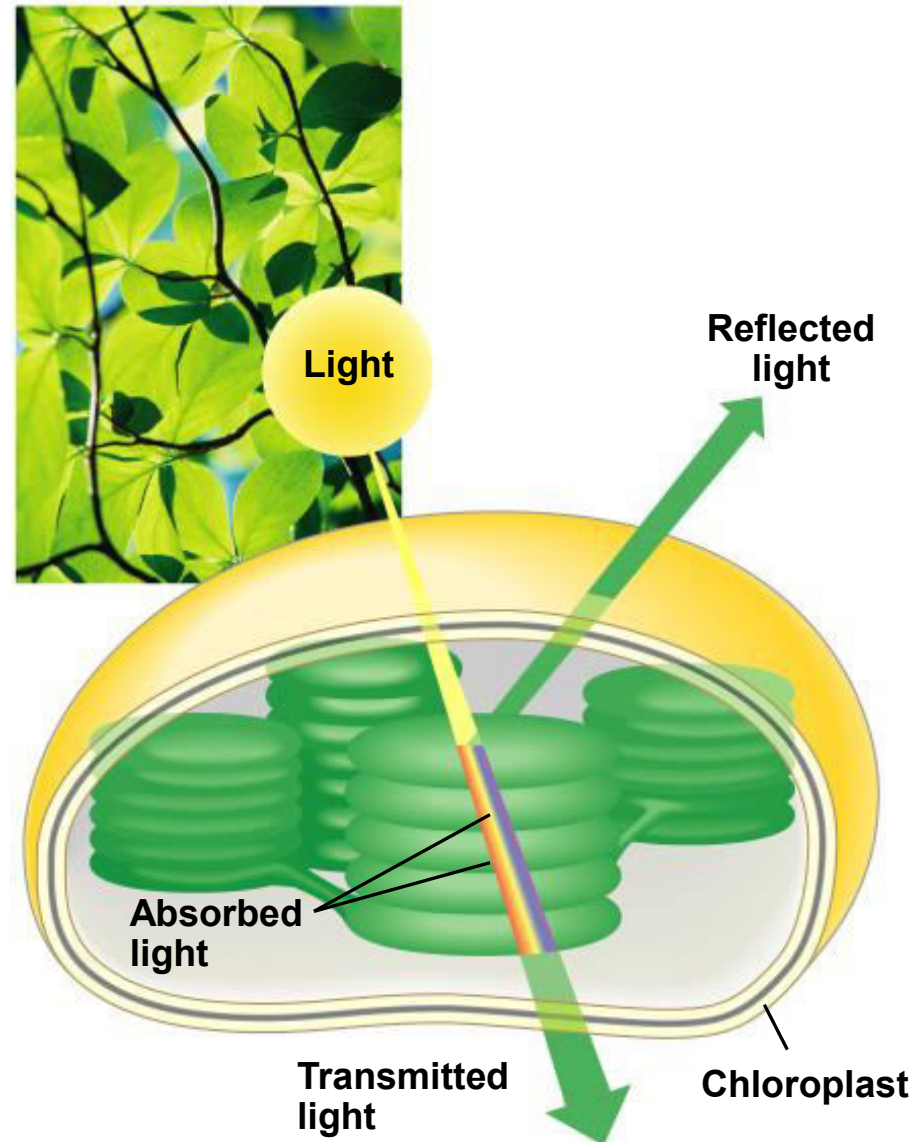
The thylakoid membrane of the chloroplast is impregnated with photosynthetic pigments (i.e., chlorophylls, carotenoids).

Plant Cells have Green Chloroplasts



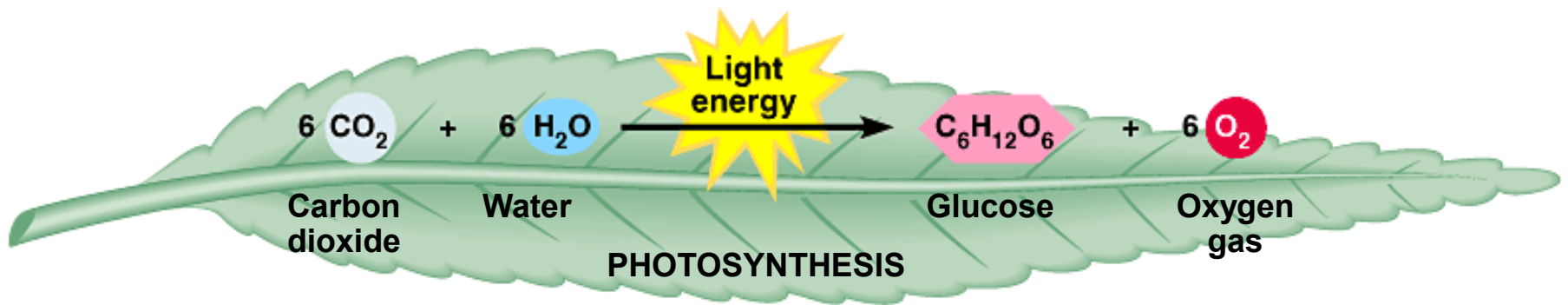
# THE COLOR OF LIGHT SEEN IS THE COLOR NOT ABSORBED

- Chloroplasts absorb light energy and convert it to chemical energy



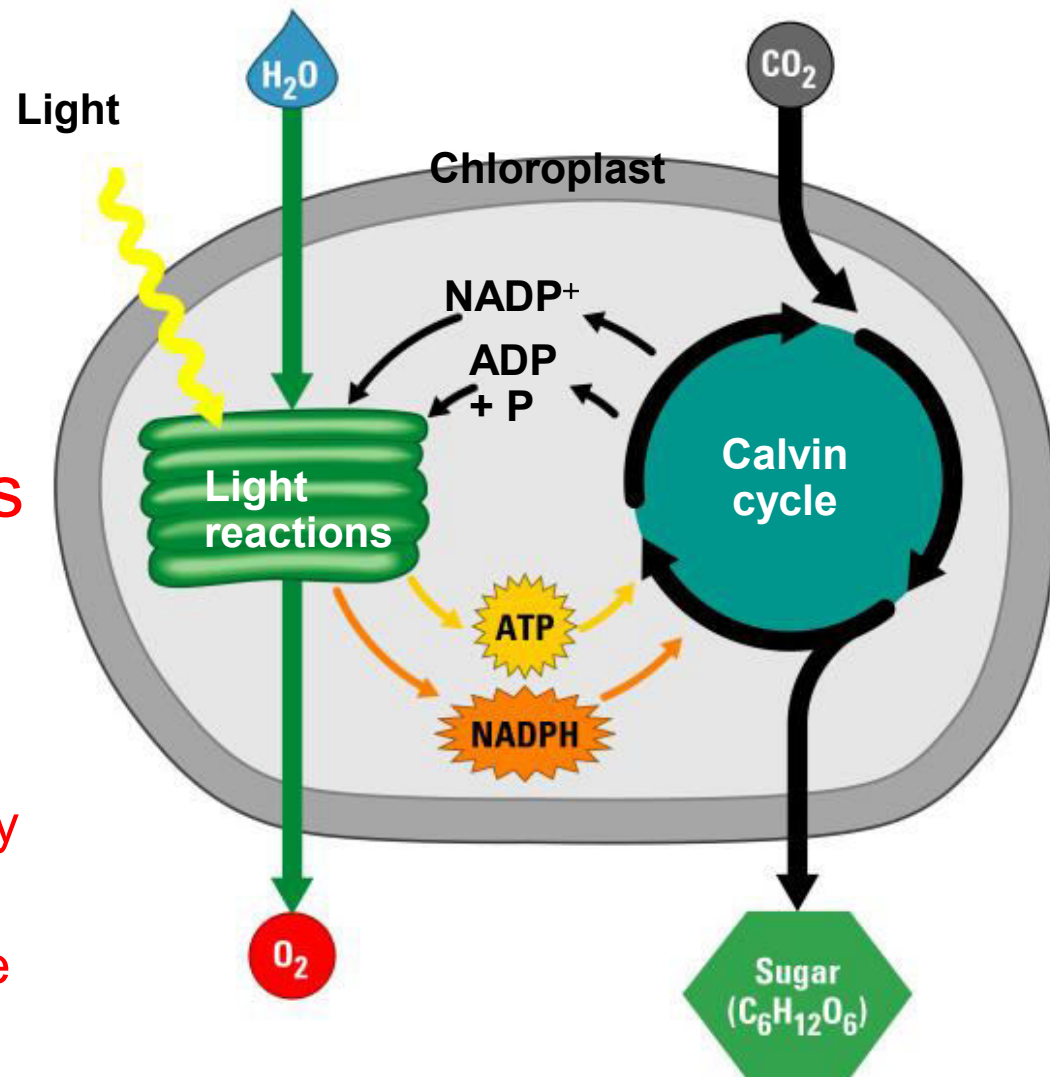
# AN OVERVIEW OF PHOTOSYNTHESIS

- Photosynthesis is the process by which autotrophic organisms use light energy to make sugar and oxygen gas from carbon dioxide and water



# AN OVERVIEW OF PHOTOSYNTHESIS

- The light reactions convert solar energy to chemical energy
  - Produce ATP & NADPH
- The Calvin cycle makes sugar from carbon dioxide
  - ATP generated by the light reactions provides the energy for sugar synthesis
  - The NADPH produced by the light reactions provides the electrons for the reduction of carbon dioxide to glucose





**It's not that  
easy bein'  
green... but it  
is essential for  
life on earth!**