PHOTOSYNTHESIS: LIGHT REACTION

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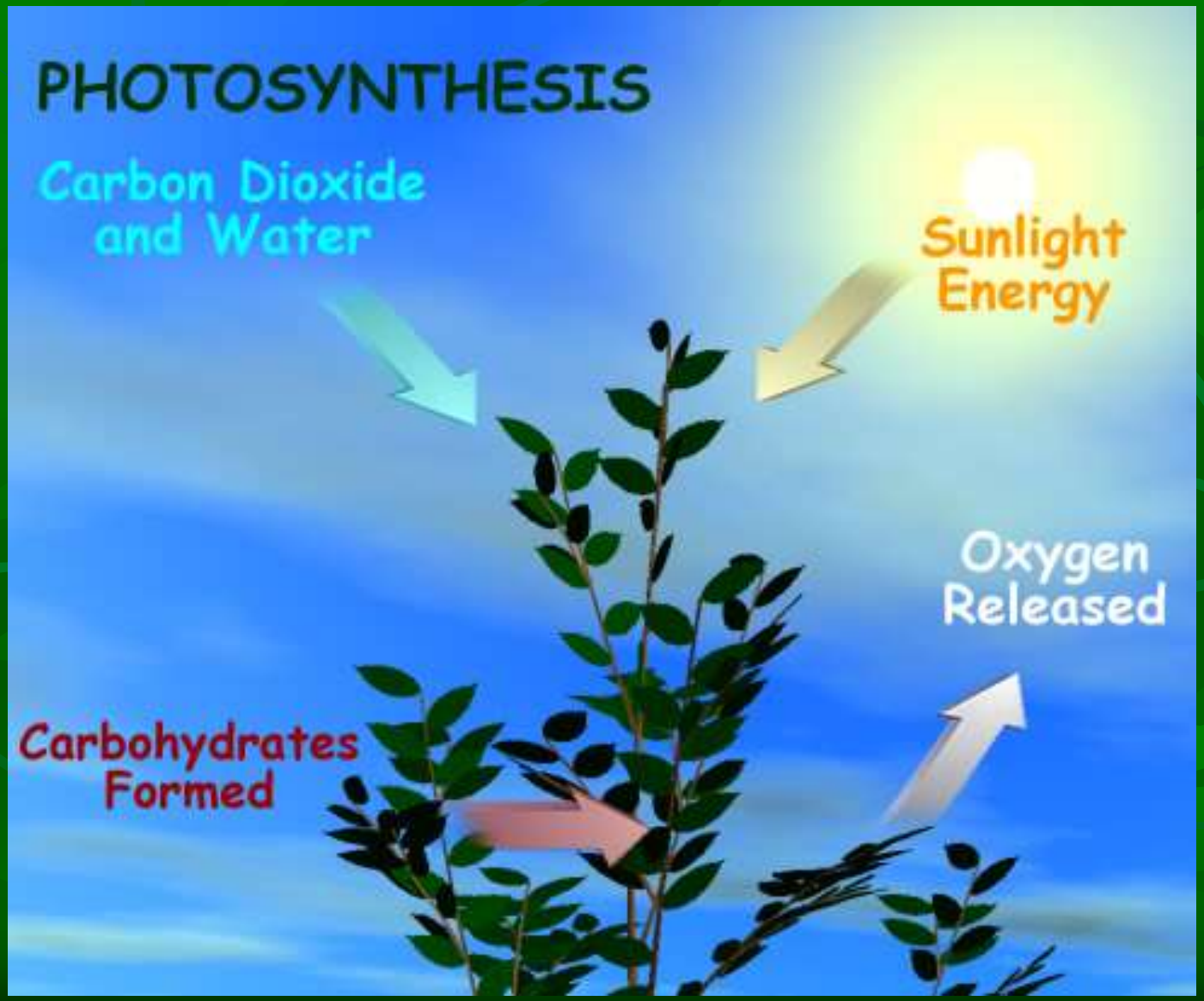
Photosynthesis

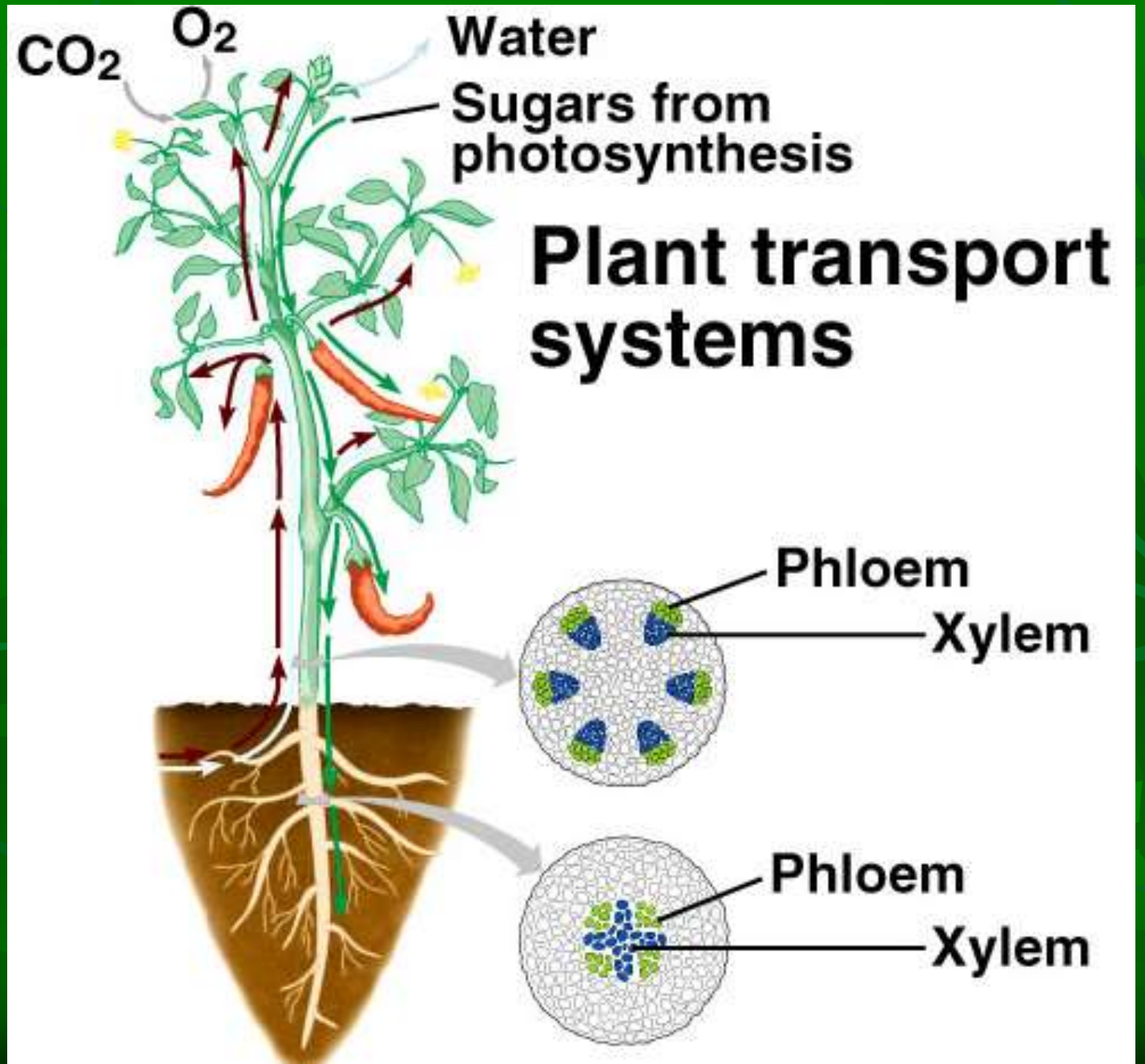


Photosynthesis.

CO_2 from atmosphere, H_2O from soil

Requires correct enzymes and pigments plus sunlight (red and blue,) ATP, NADPH to convert the reactants into the products

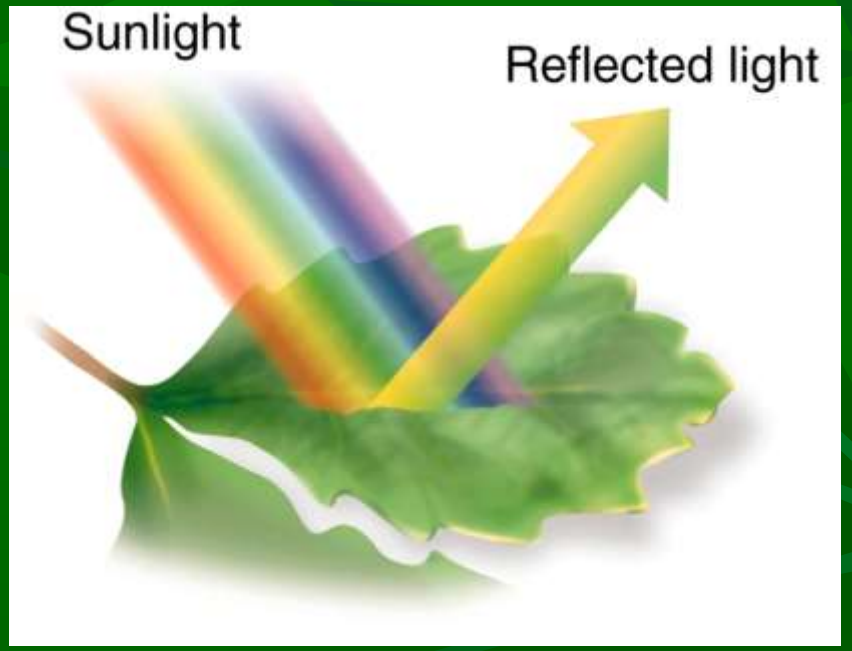
$$6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$$


CO_2
O_2
Water
Sugars from photosynthesis
Plant transport systems
Phloem
Xylem
Phloem
Xylem

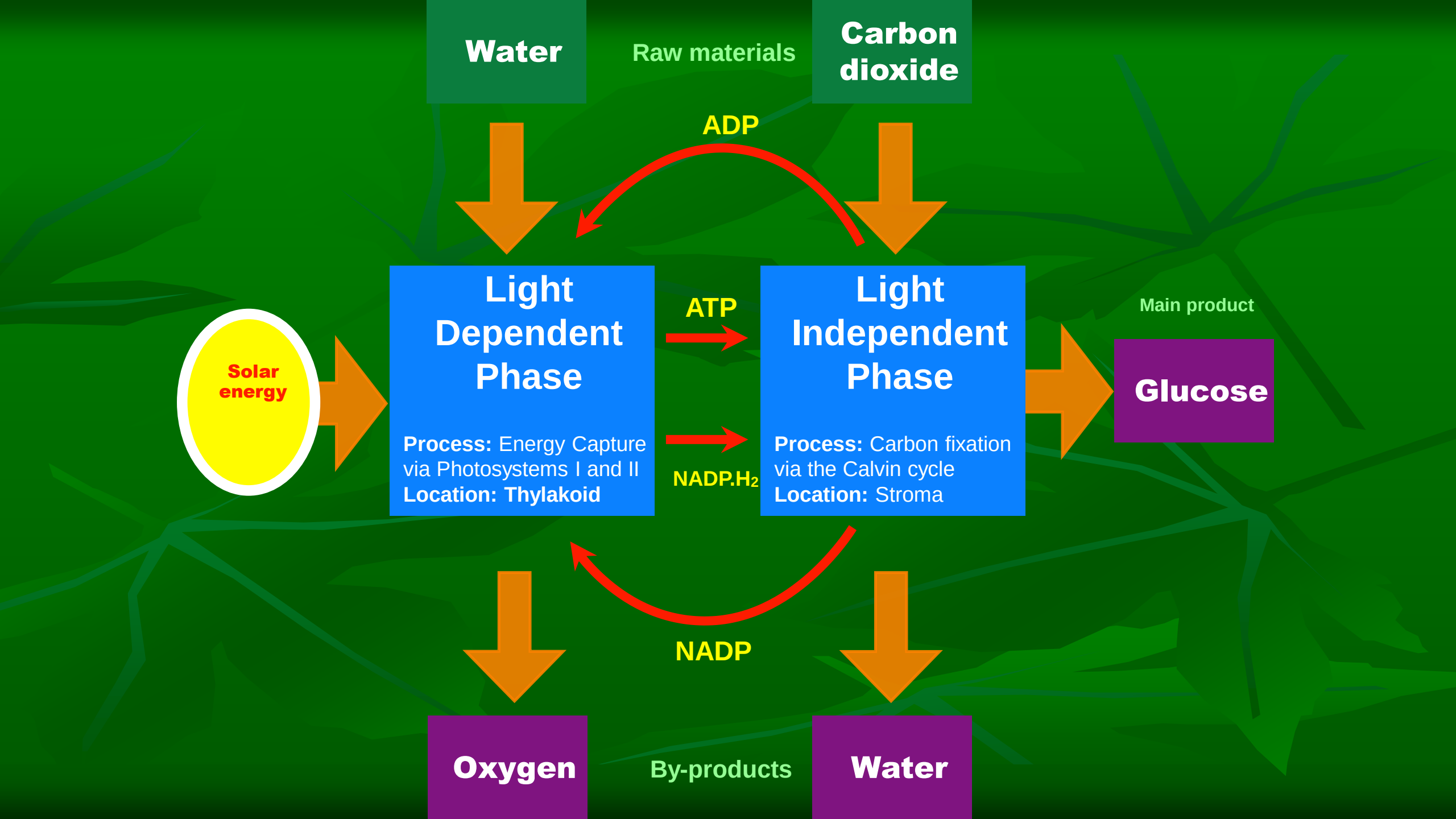
What happens to light when it strikes an object?

- reflected (bounced off)

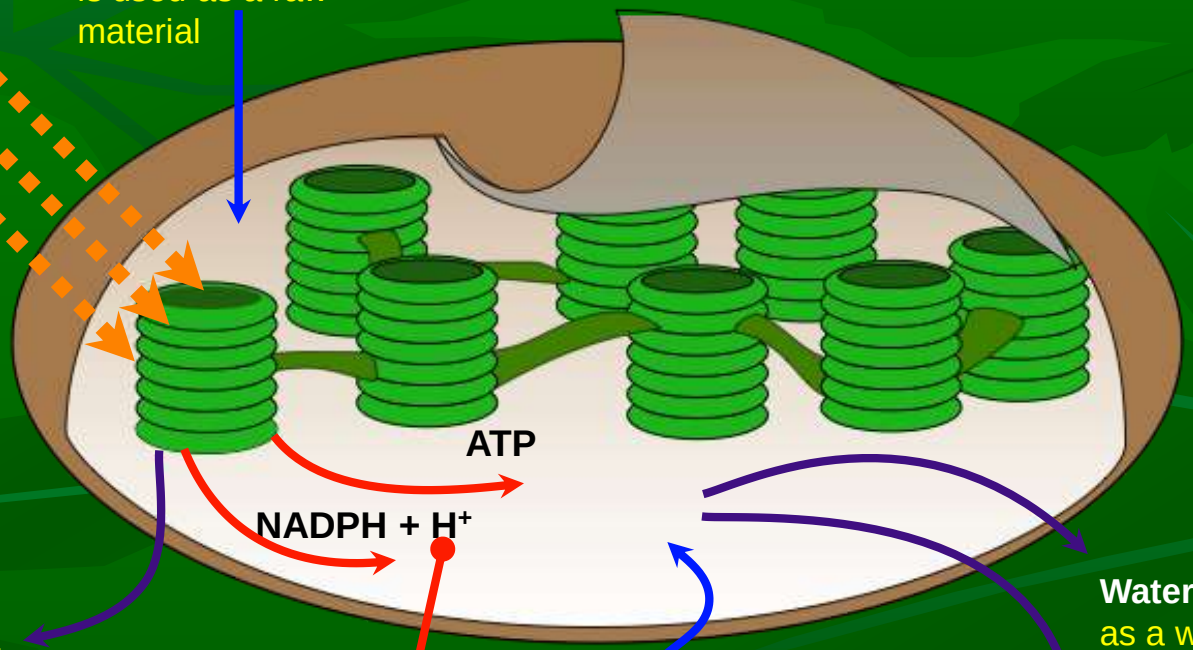
- transmitted (passes through)
- absorbed



Only absorbed wavelengths of light function in photosynthesis.


Water
Raw materials
Carbon dioxide
ADP
Solar energy
Light Dependent Phase
Process: Energy Capture via Photosystems I and II
Location: Thylakoid
ATP
NADP.H2
Light Independent Phase
Process: Carbon fixation via the Calvin cycle
Location: Stroma
Main product
Glucose
NADP
Oxygen
By-products
Water

A Summary of Photosynthesis…



Oxygen gas (from the break up of water molecules) is given off as a waste product.

Hydrogen (from the break up of water molecules) is used as a raw material.

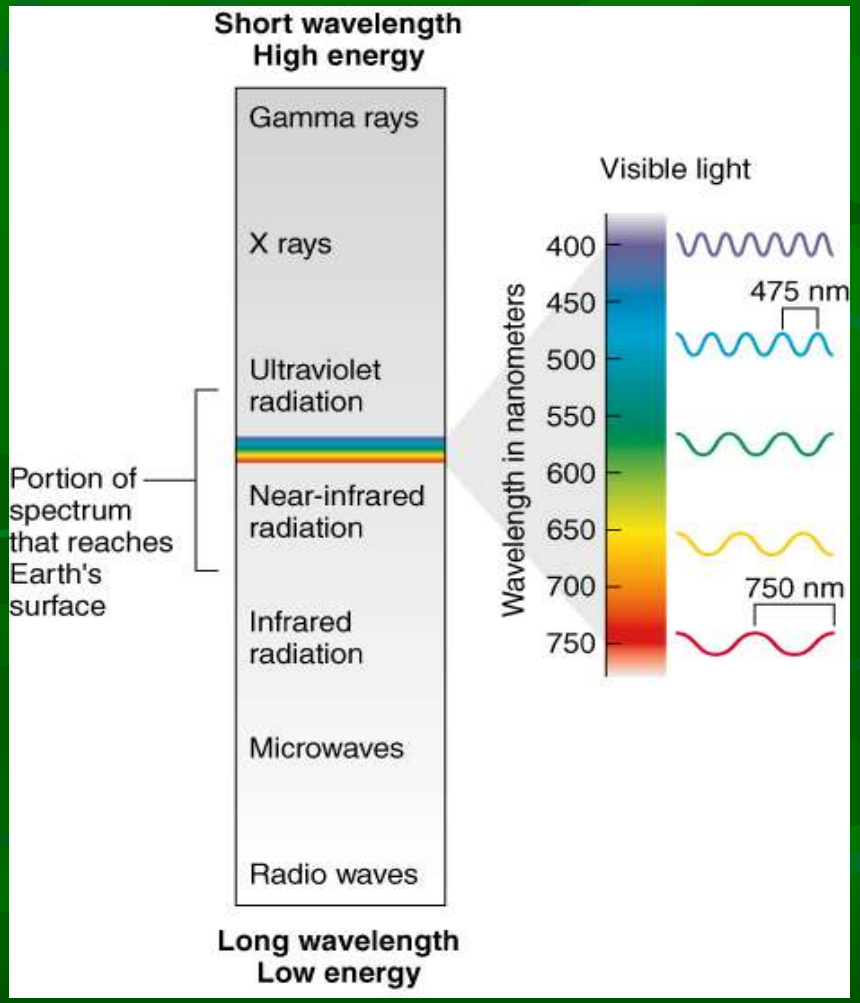
Carbon dioxide from the air provides carbon and oxygen as raw materials. Carbon is fixed in the Light independent phase

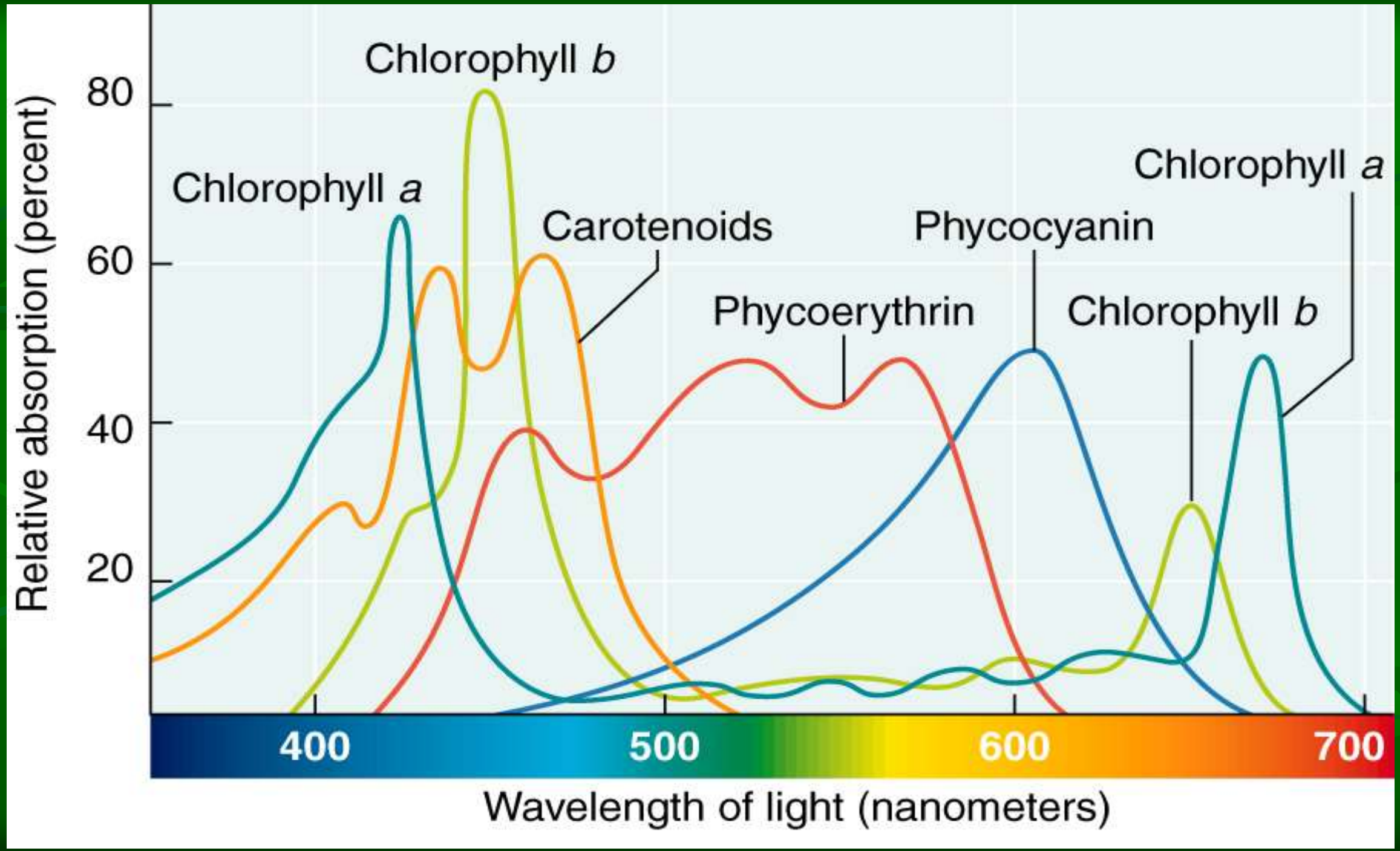
Water is given off as a waste product.

triose phosphate (a 3-carbon sugar)

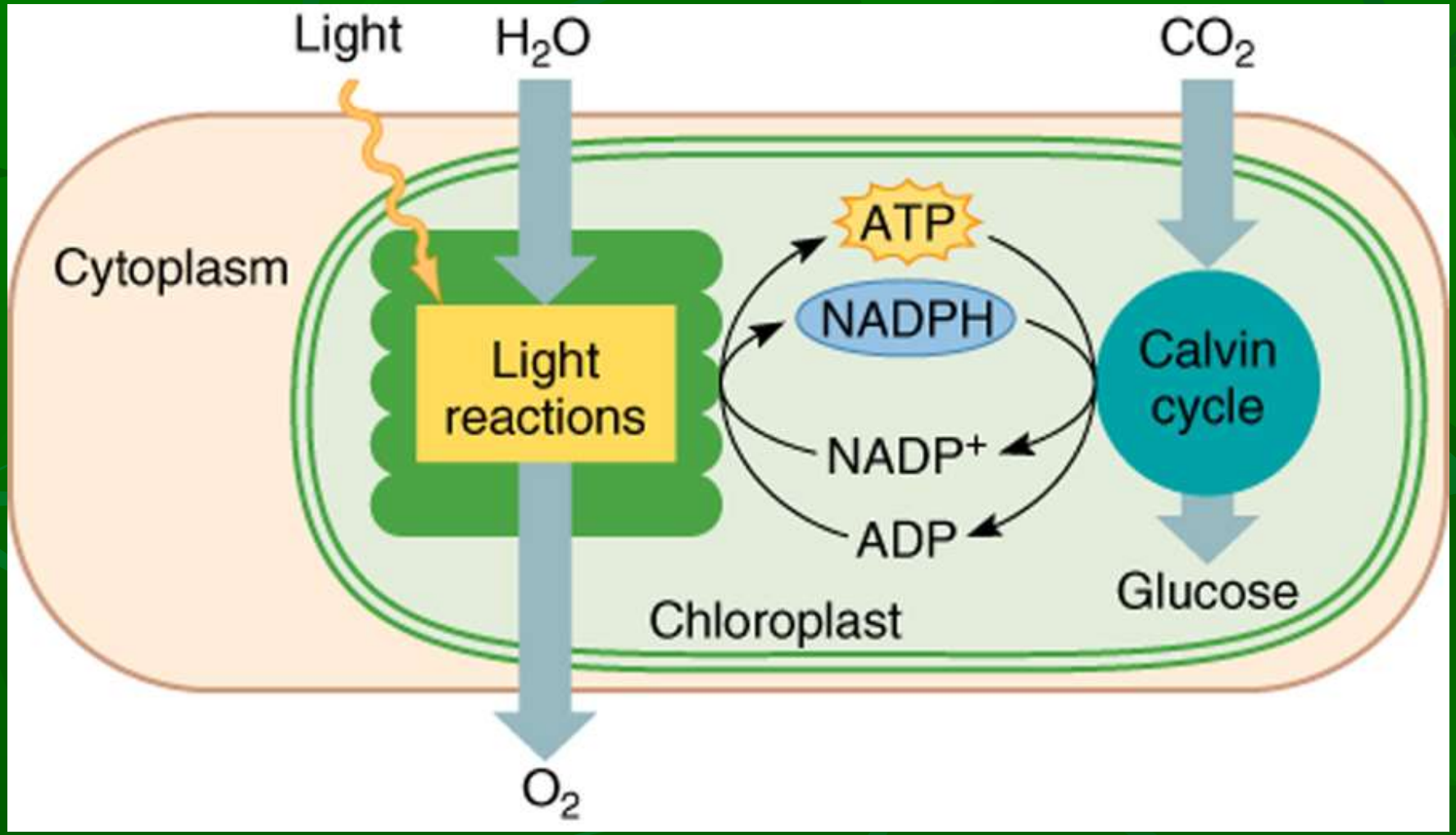
Light

Visible light makes up only a small portion of the electromagnetic spectrum.



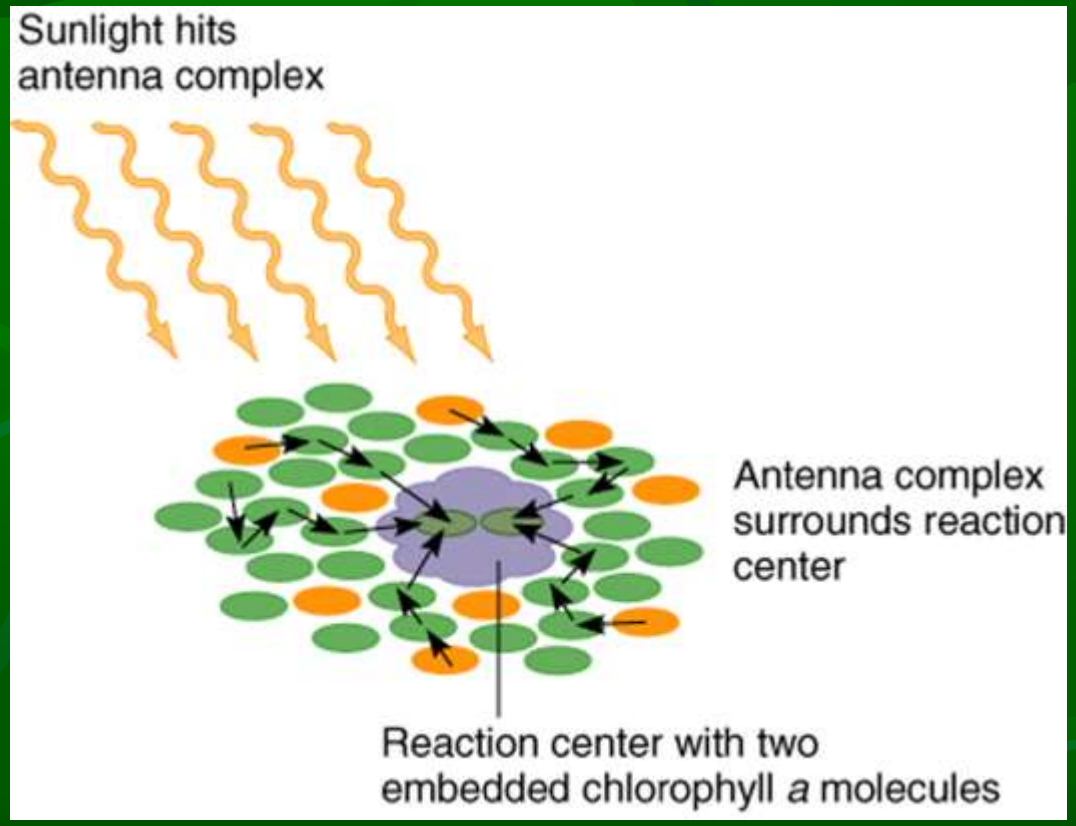

Chlorophyll b
Chlorophyll a
Carotenoids
Phycocyanin
Chlorophyll a
Phycoerythrin
Chlorophyll b
Relative absorption (percent)
80
60
40
20
400
500
600
700
Wavelength of light (nanometers)

Overview of Photosynthesis



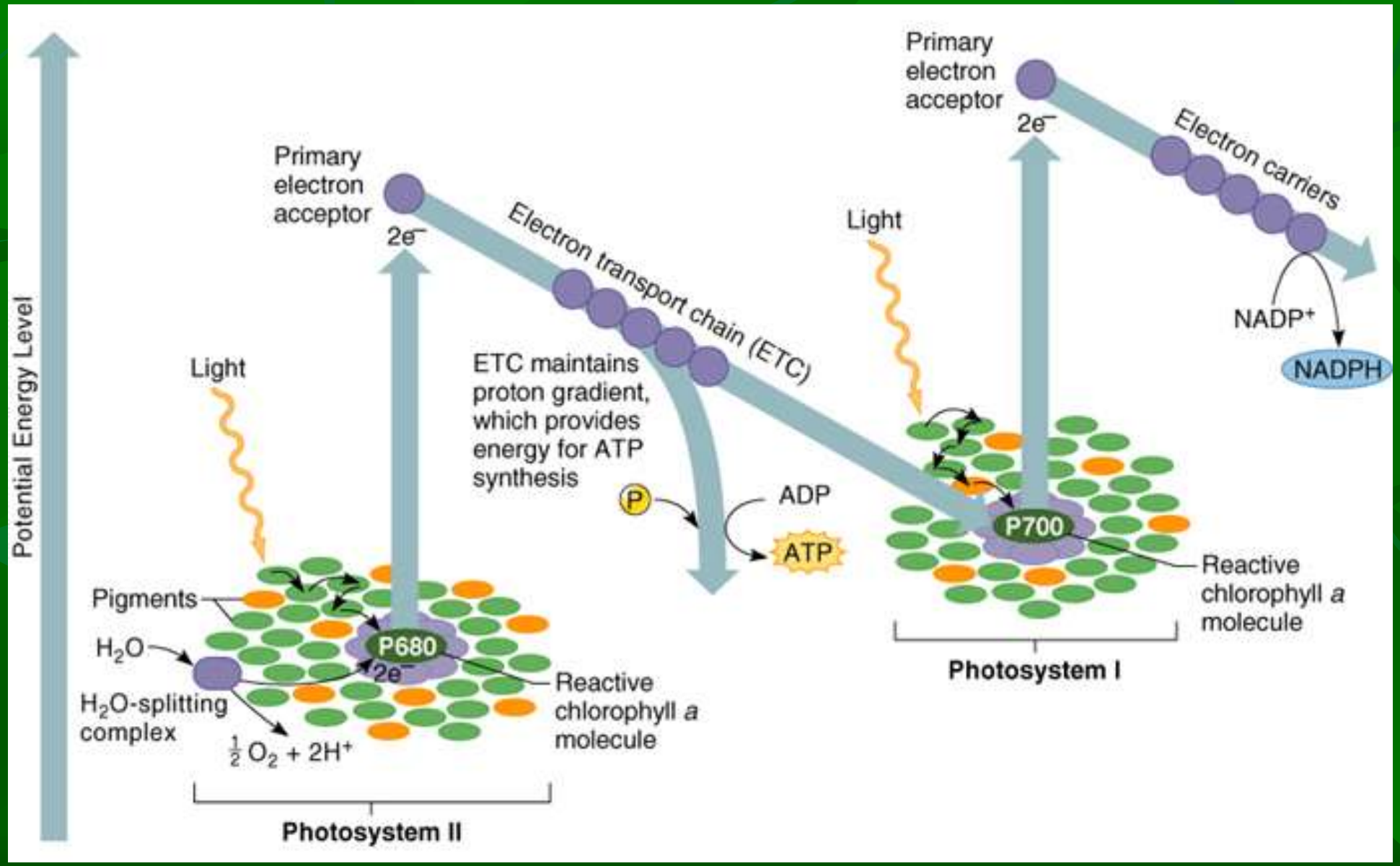
Light Reactions

- require light
- occur in *thylakoids* of chloroplasts
- involve photosystems II & I (light harvesting systems).



Photosystems contain *antenna complex* that captures photon energy & passes it to a *reaction center*.

Light Reactions of Photosynthesis



Light Reactions

1. Light drives both photosystems (PS).
2. Water splits, O_2 formed & electron to PS II
3. excited electron enters ETC. ATP is made, similar to respiration.
4. electron replaces the one lost in PS I.
5. electron from PS I enters ETC.
6. This ETC produces NADPH

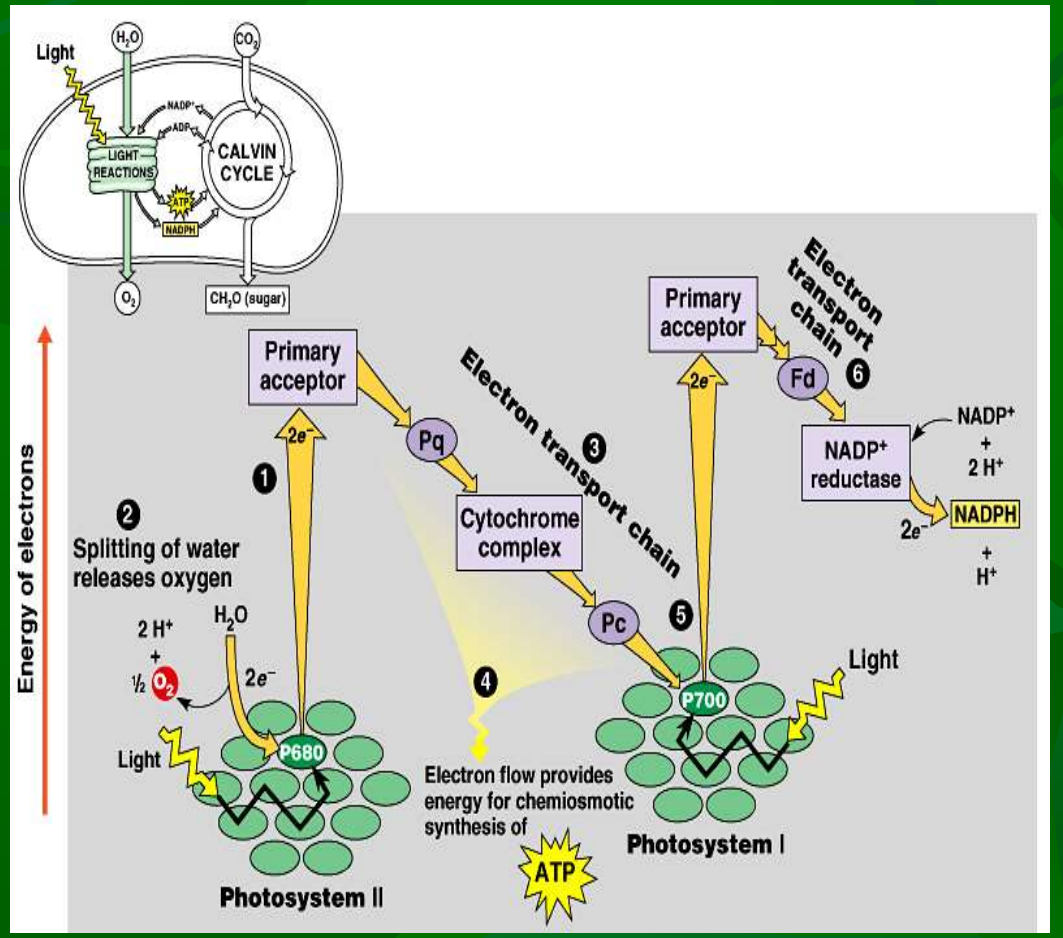


Fig. 10.13

Light Dependent Reactions – the Z-Scheme

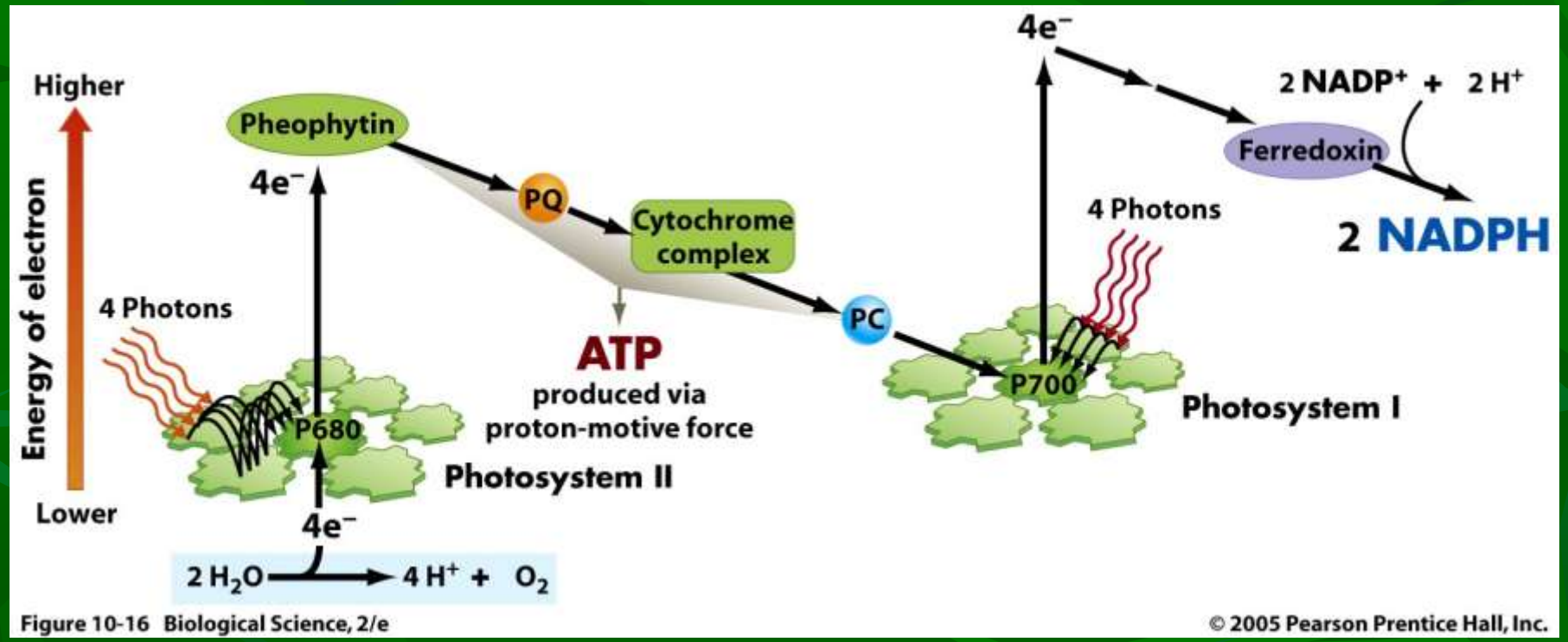


Figure 10-16 Biological Science, 2/e

Light Dependent Reactions

- Products:
  - ATP
  - NADPH
  - O_2

Thank You