



Photosynthesis

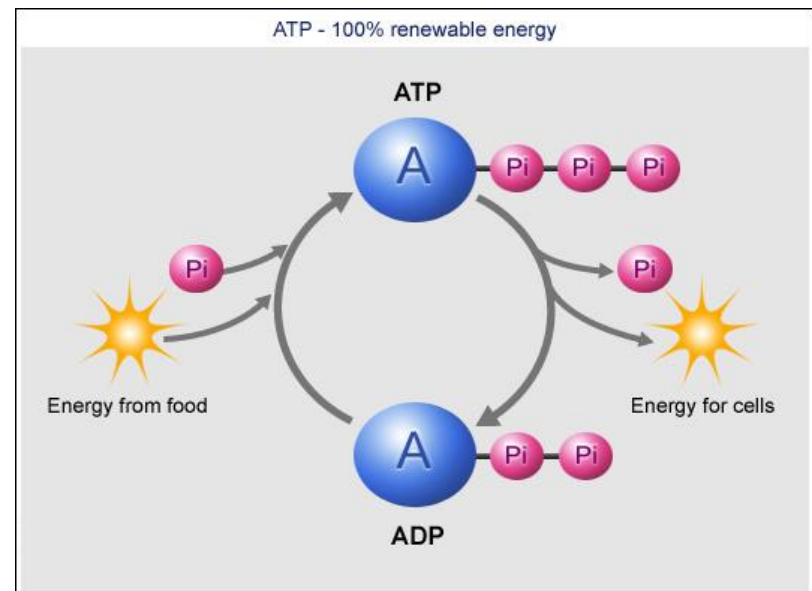
Chapter 8

8.1 Energy and Life

- Some animals make their own food using energy from sunlight-autotrophs
- Some animals have to get their energy by consuming food-heterotrophs

8.1 Energy and Life

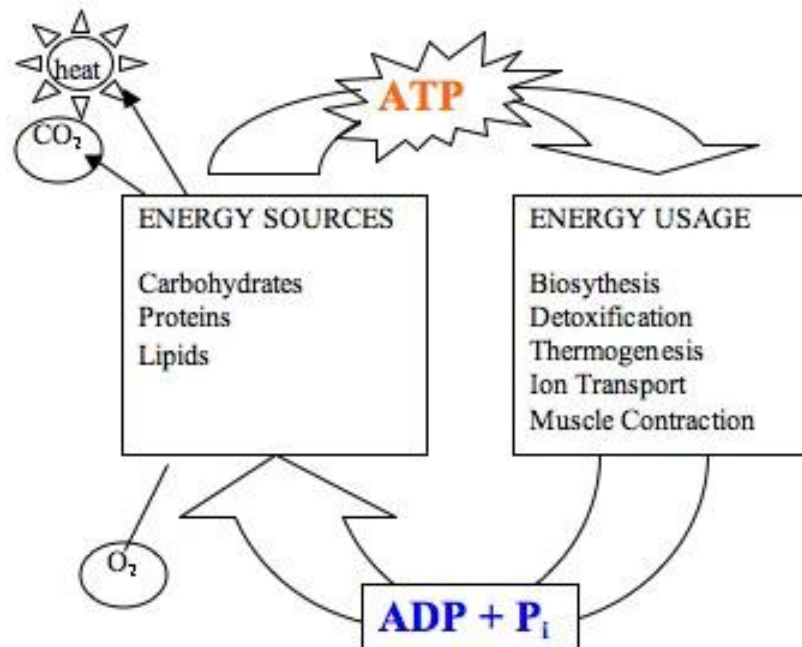
- ATP is one of the principle molecules cells use to store energy
- Like a rechargeable battery



All living cells rely on one source of energy to do everything from building molecules to flexing muscles - ATP (adenosine triphosphate). Breaking down ATP releases energy, and cells constantly replace their ATP by wacking a spare phosphate onto ADP (adenosine diphosphate). The energy for that comes from food we eat (in animals) or make (in plants). Enzymes control the breaking and making of ATP.

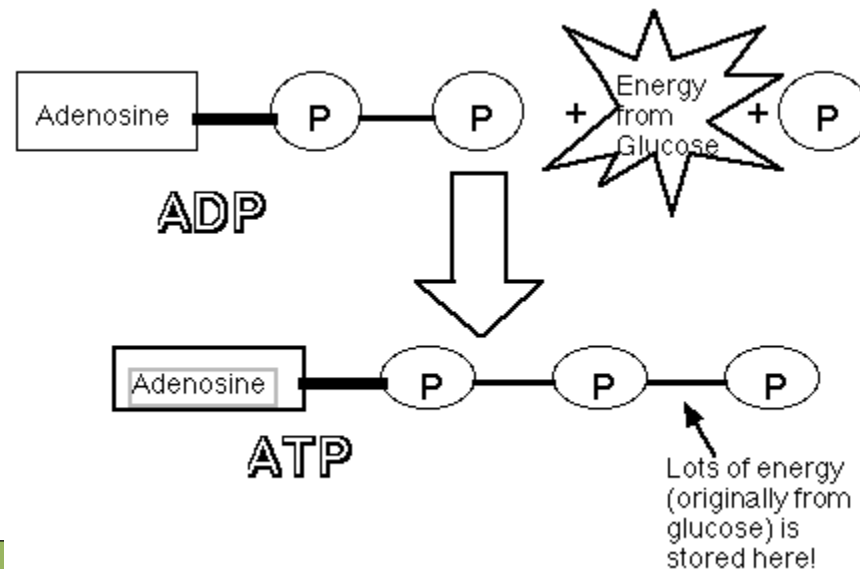
8.1 Energy and Life

- ATP is used in many chemical reactions in cells



8.1 Energy and Life

- ATP does not store a lot of energy long term
- Glucose, which can store 90 times more energy than ATP is used instead



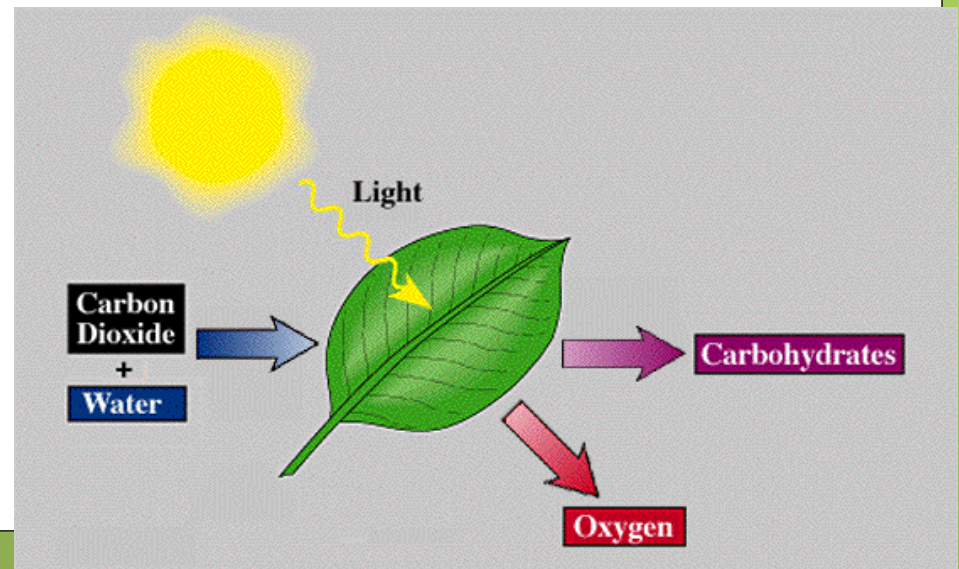
8.2 Photosynthesis Overview

- How does this happen? Where does all the matter come from?!



8.2 Photosynthesis Overview

- Early experiments (up to 1780) by Helmont, Priestly and Ingenhousz showed the requirement for light, CO₂ and H₂O to make carbohydrates in plant
- $6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow{+\text{energy}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

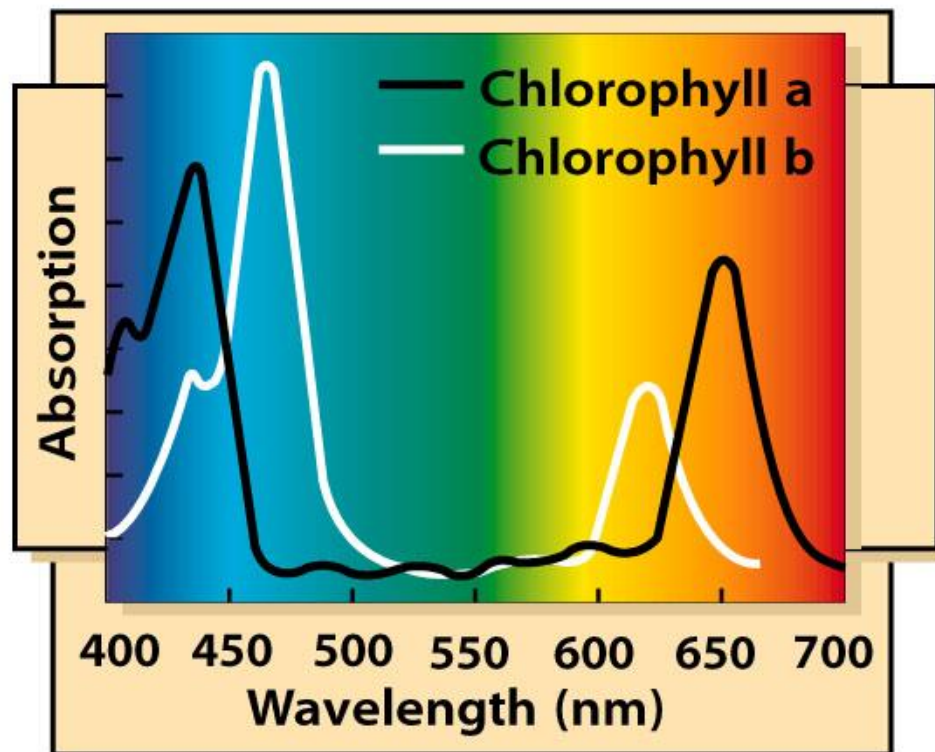


8.2 Photosynthesis Overview

- Light and Pigment
- Pigments are colored molecules that absorb and transmit certain wavelengths of light
- In plants the main pigment is chlorophyll
- When pigments absorb light they absorb energy

8.2 Photosynthesis Overview

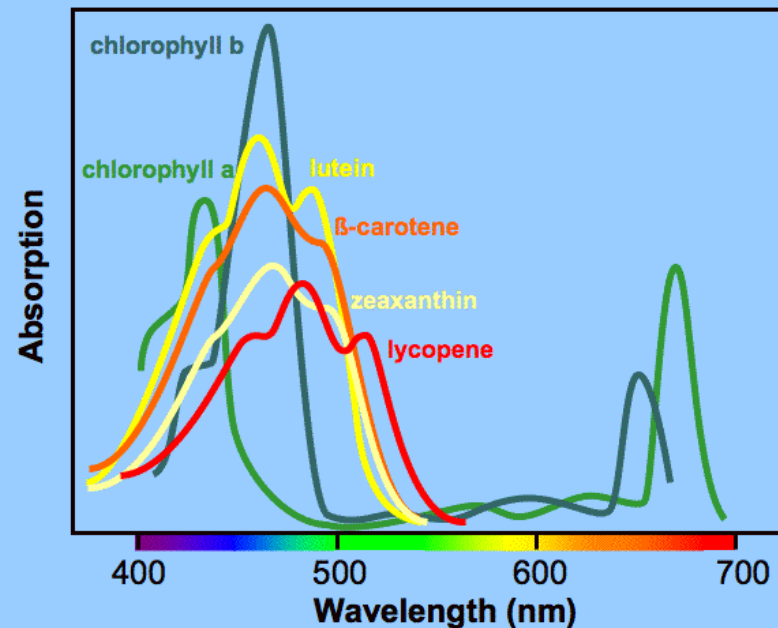
- Absorbance spectrum of chlorophyll A&B



8.2 Photosynthesis Overview

- Absorbance spectra of other photosynthetic pigments

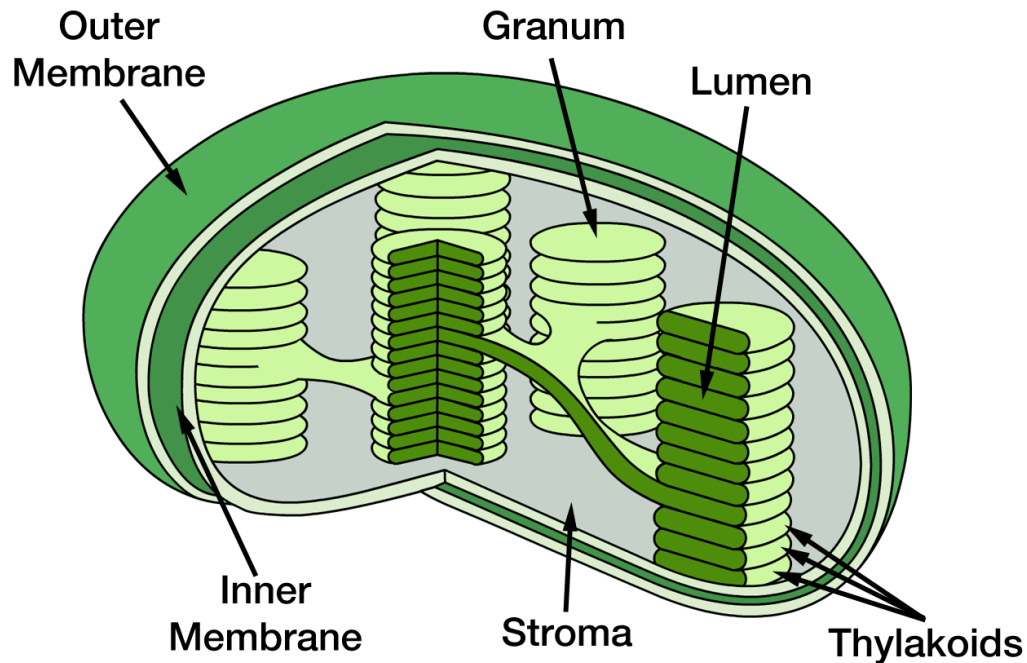
The photosynthetic pigments absorb much of the spectrum



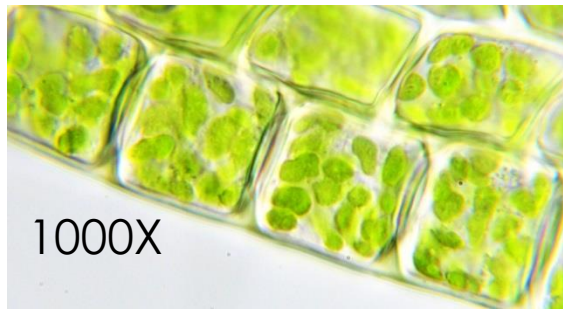
8.3 Reactions in Photosynthesis

- Structure of chloroplasts

Chloroplast



8.3 Reactions in Photosynthesis



Chloroplast

Chlorine

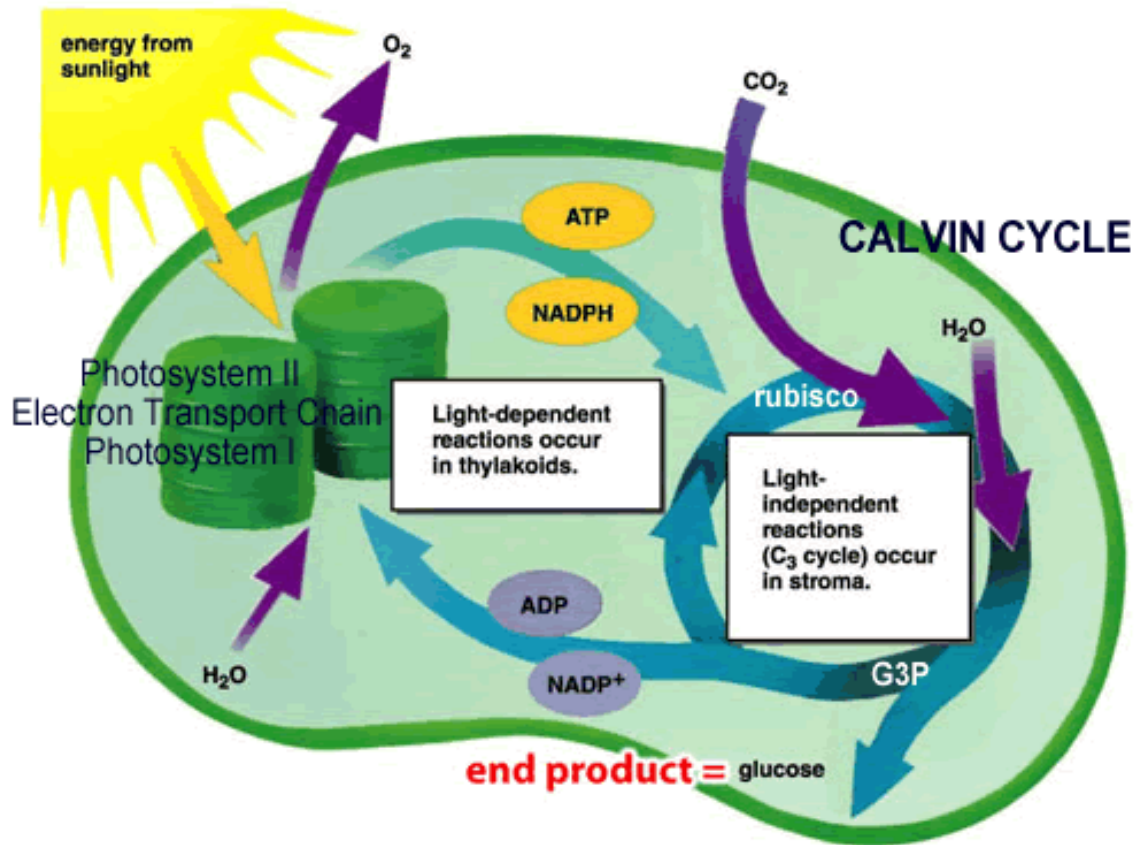
17

Cl

35.453



8.3 Reactions in Photosynthesis



8.3 Reactions in Photosynthesis

- Light dependent reactions
- $\text{ADP} + \text{P}_i + \text{energy} \rightarrow \text{ATP}$
- $\text{NADP}^+ + 2\text{e}^- + \text{H}^+ \rightarrow \text{NADPH}$
- https://www.youtube.com/watch?v=BK_cjd6Evcw
- <https://www.youtube.com/watch?v=v590JJV96lc>

8.3 Reactions in Photosynthesis

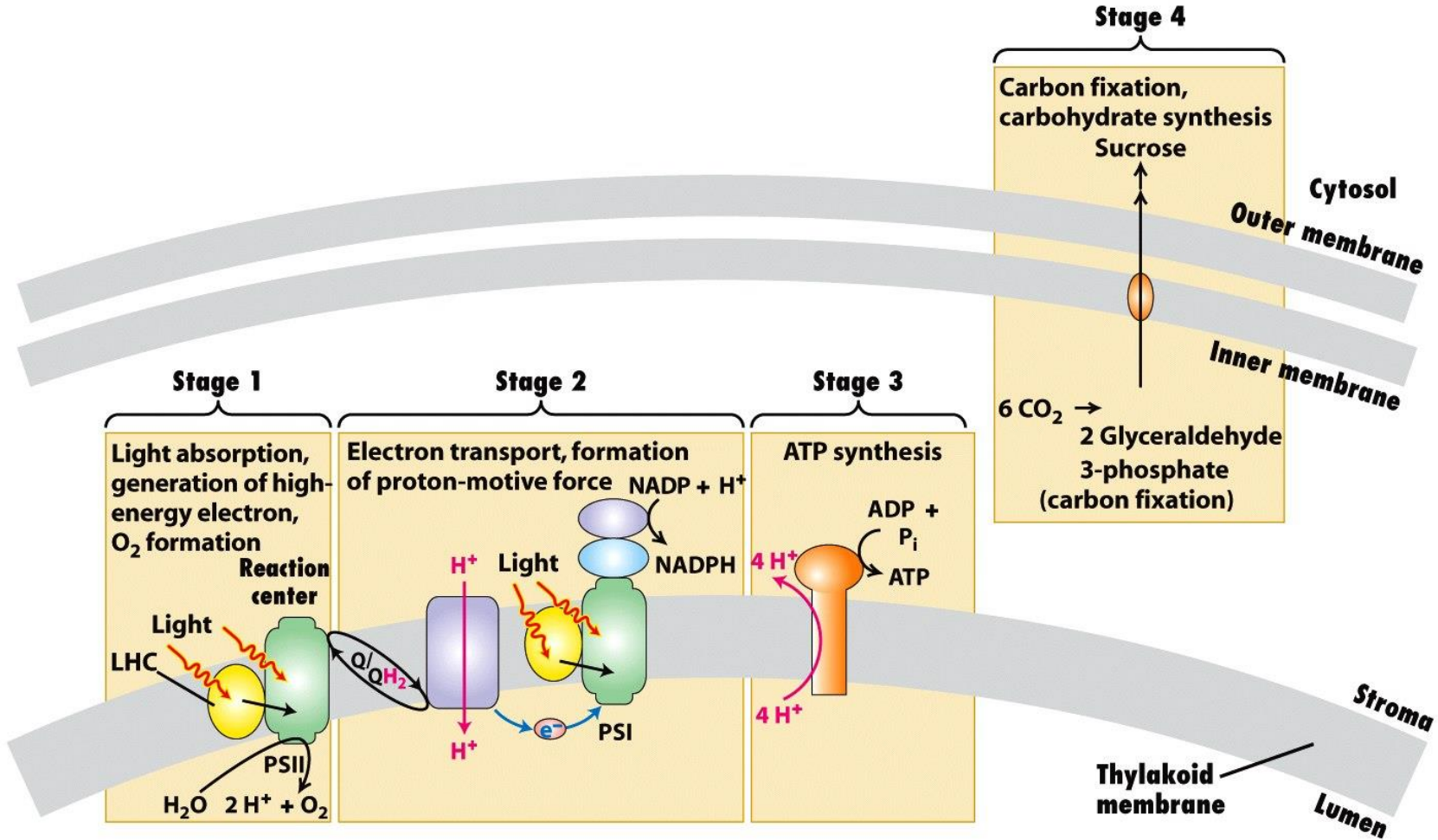
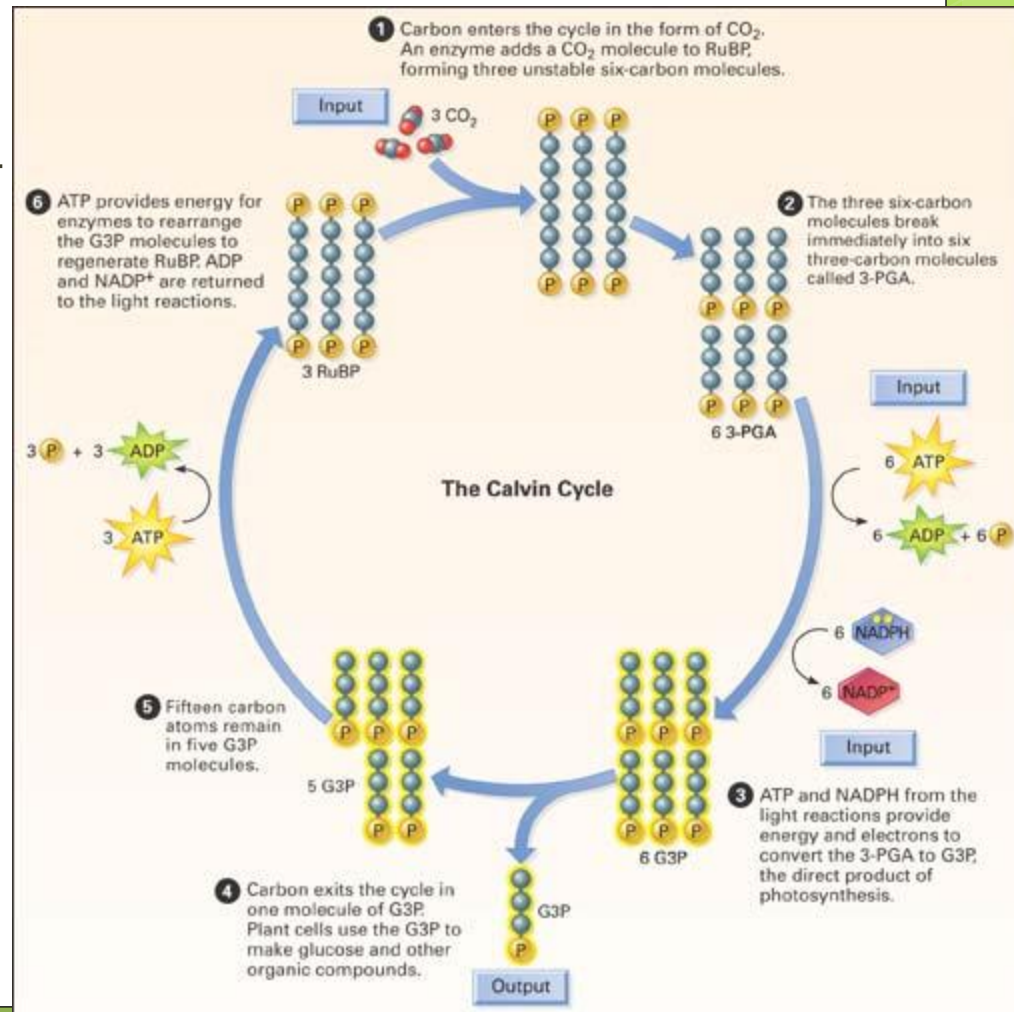


Figure 12-30
Molecular Cell Biology, Sixth Edition
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8.3 Reactions in Photosynthesis

- Light independent reactions or Calvin Cycle



8.3 Reactions in Photosynthesis

- Light independent reactions or Calvin Cycle
- <https://www.youtube.com/watch?v=0UzMaoaXKaM>

8.3 Reactions in Photosynthesis

- https://www.youtube.com/watch?v=joZ1EsA5_NY

8.3 Reactions in Photosynthesis

- Factors affecting photosynthesis
- Water, temperature and intensity of light
- https://www.youtube.com/watch?v=Aey_pailoMPI