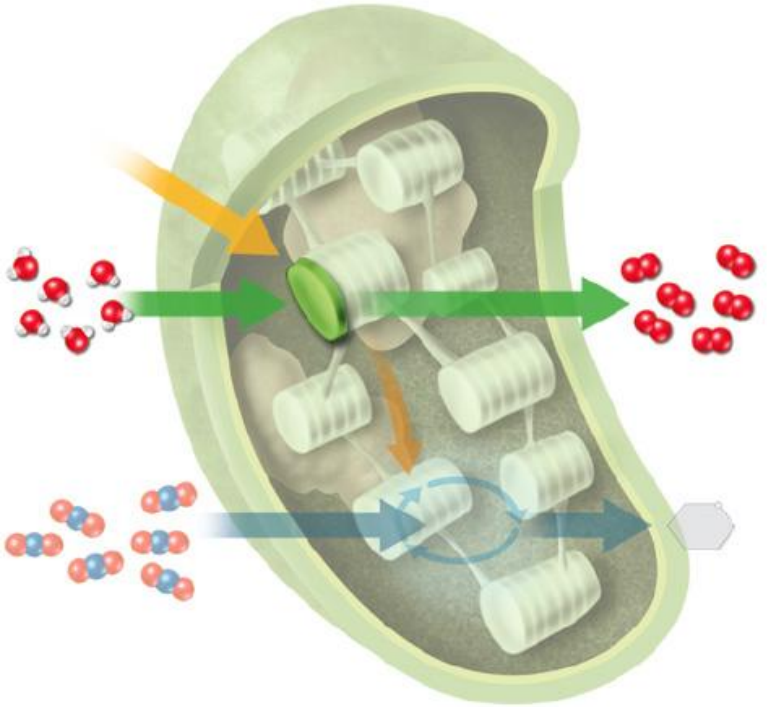
4.3 Photosynthesis in Detail

KEY CONCEPT

Photosynthesis requires a series of chemical reactions.

4.3 Photosynthesis in Detail

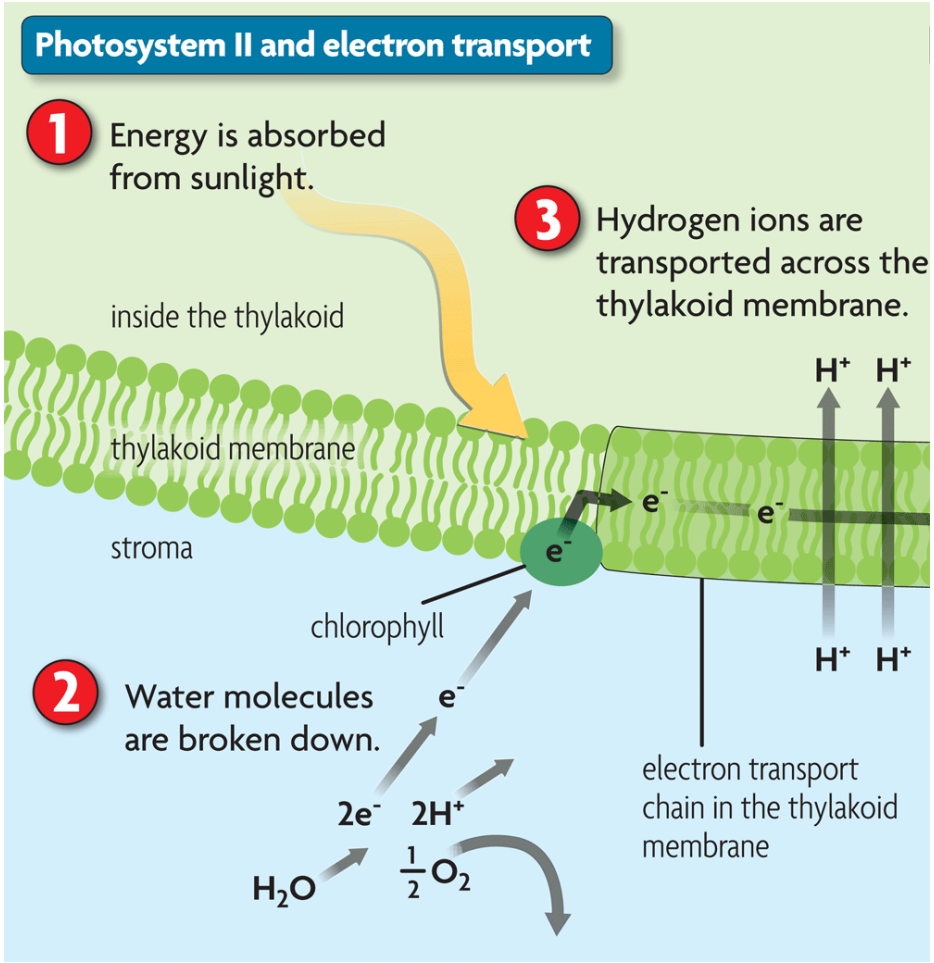
- **The first stage of photosynthesis captures and transfers energy.**
  - The light-dependent reactions include groups of molecules called photosystems.



Light-dependent reactions take place in and across the thylakoid membrane.

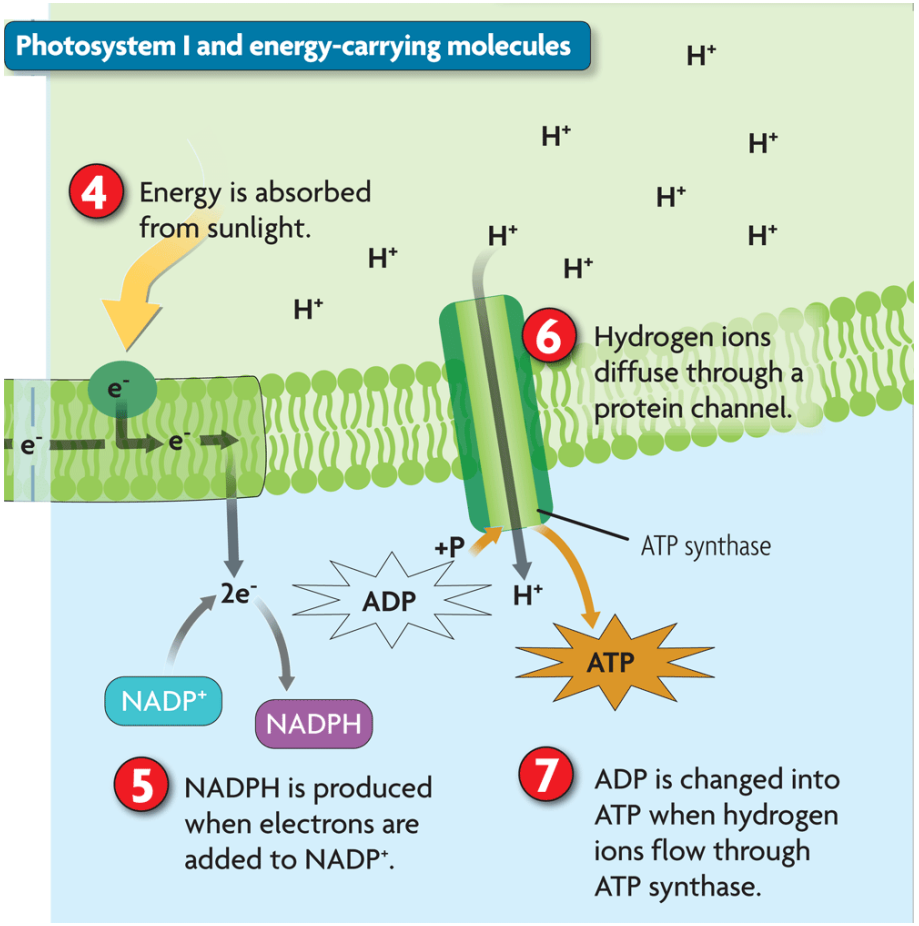
4.3 Photosynthesis in Detail

- Photosystem II captures and transfers energy.
  - chlorophyll absorbs energy from sunlight
  - energized electrons enter electron transport chain
  - water molecules are split
  - oxygen is released as waste
  - hydrogen ions are transported across thylakoid membrane



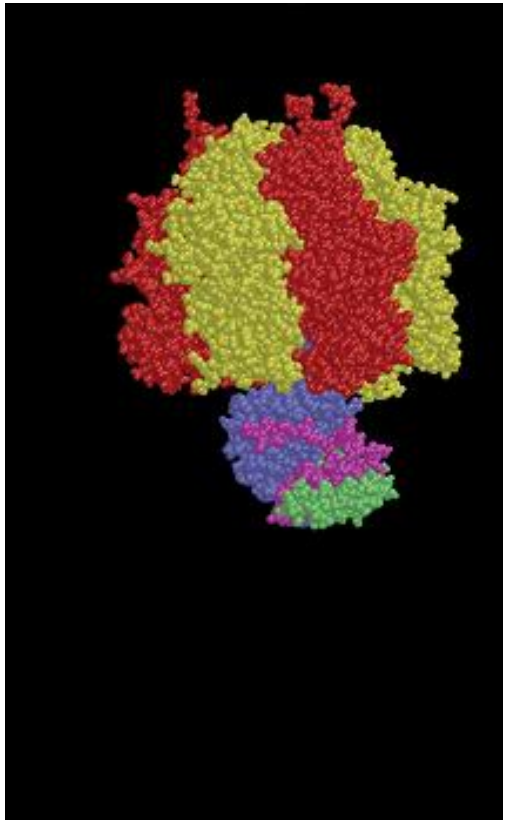
4.3 Photosynthesis in Detail

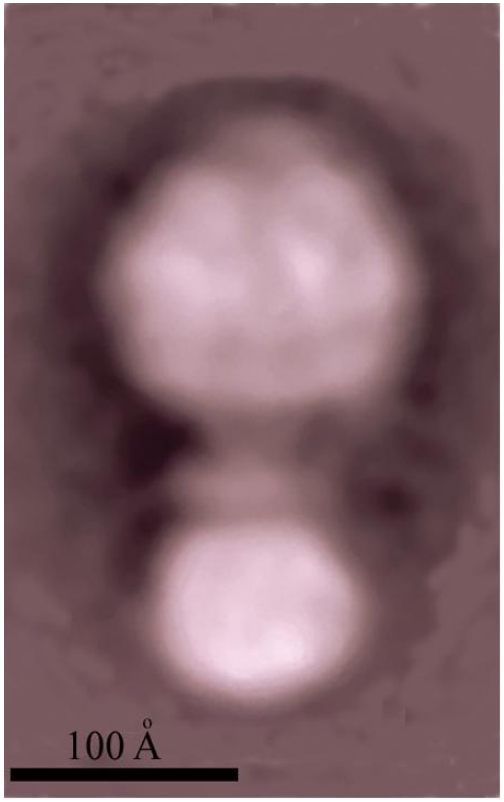
- Photosystem I captures energy and produces energy-carrying molecules.
  - chlorophyll absorbs energy from sunlight
  - energized electrons are used to make NADPH
  - NADPH is transferred to light-independent reactions



4.3 Photosynthesis in Detail

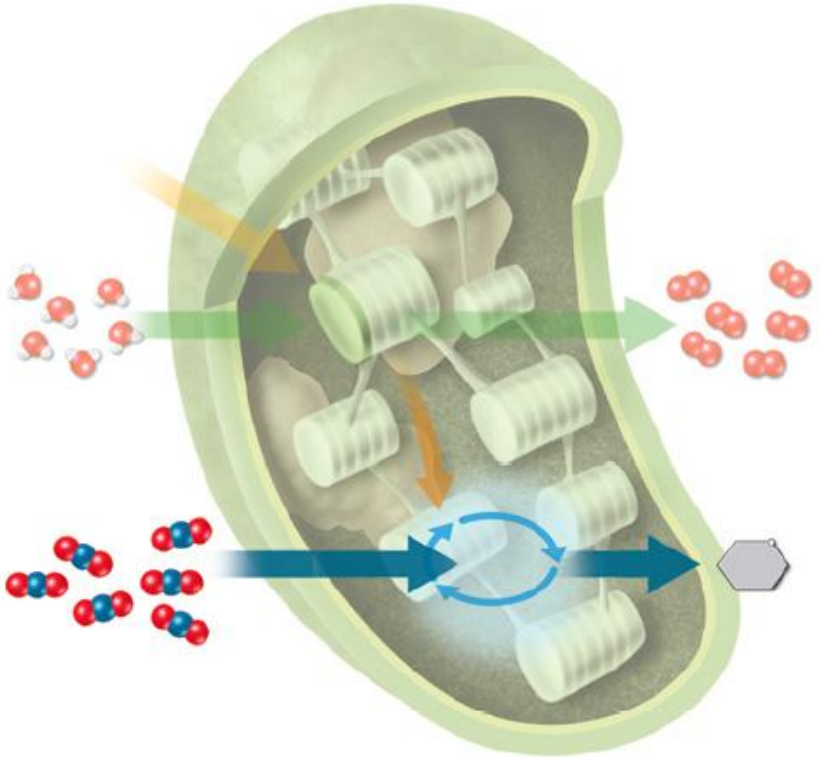
- The light-dependent reactions produce ATP.
  - hydrogen ions flow through a channel in the thylakoid membrane
  - ATP synthase attached to the channel makes ATP





4.3 Photosynthesis in Detail

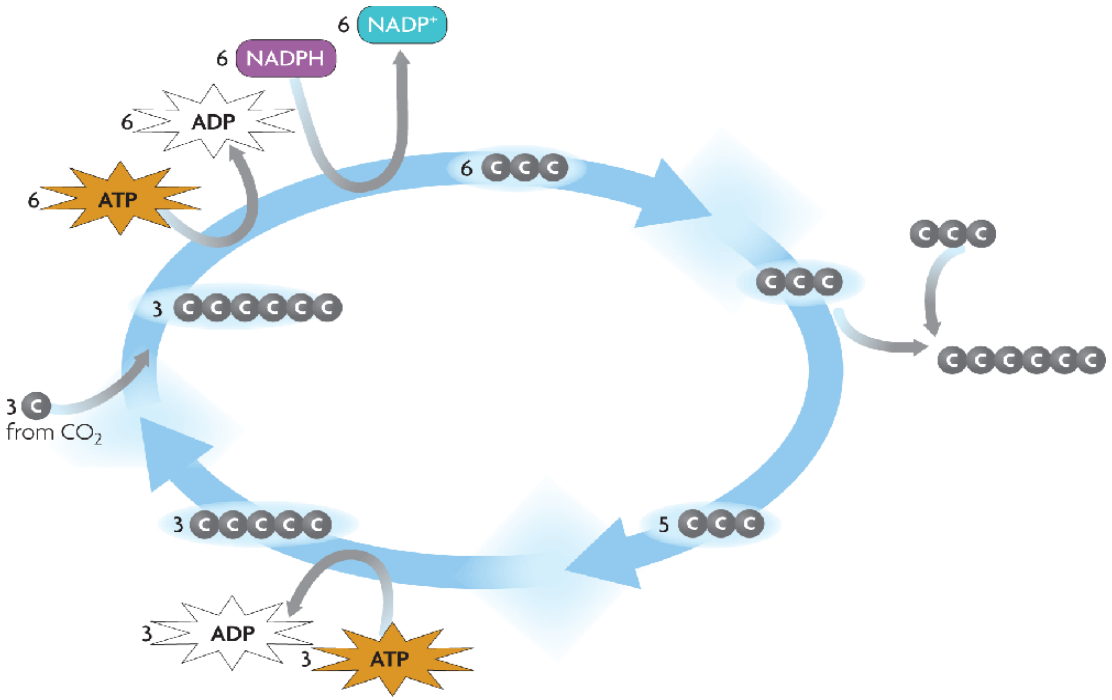
- **The second stage of photosynthesis uses energy from the first stage to make sugars.**
  - Light-independent reactions occur in the stroma and use CO_2 molecules.



Light-independent reactions take place in the stroma.

4.3 Photosynthesis in Detail

- A molecule of glucose is formed as it stores some of the energy captured from sunlight.
  - carbon dioxide molecules enter the Calvin cycle
  - energy is added and carbon molecules are rearranged
  - a high-energy three-carbon molecule leaves the cycle



4.3 Photosynthesis in Detail

- A molecule of glucose is formed as it stores some of the energy captured from sunlight.
  - two three-carbon molecules bond to form a sugar
  - remaining molecules stay in the cycle