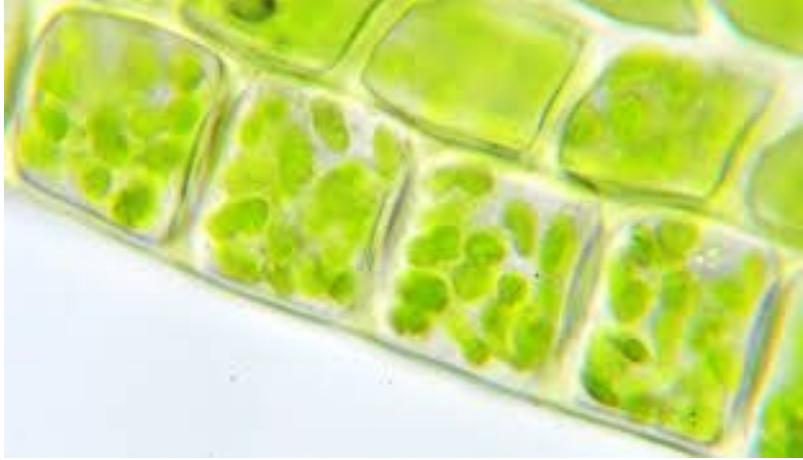
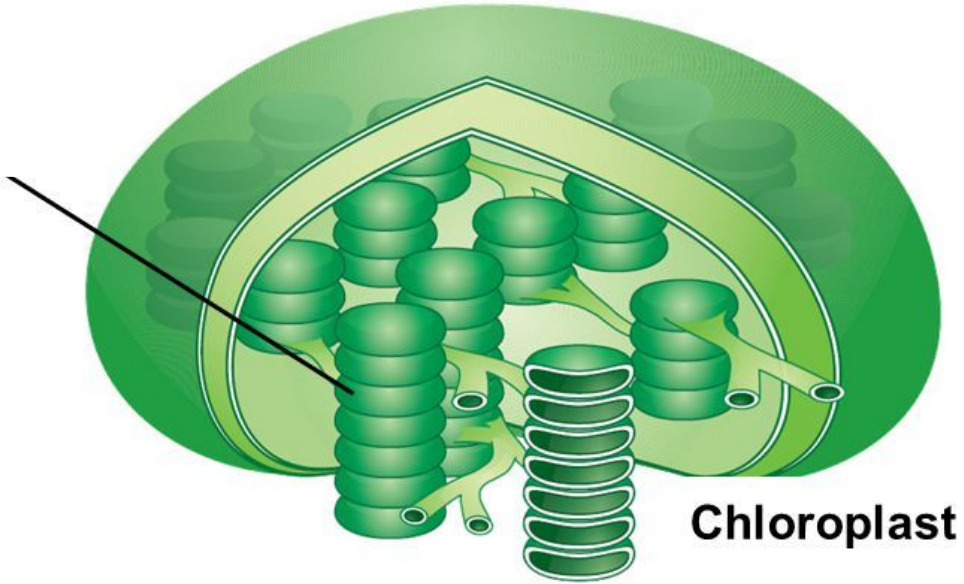
Let's Review!

Chloroplasts: the organelle in plant cells where photosynthesis takes place





Thylakoids: saclike photosynthetic membranes

Grana: stacks of thylakoids

Stroma: The space surrounding the grana

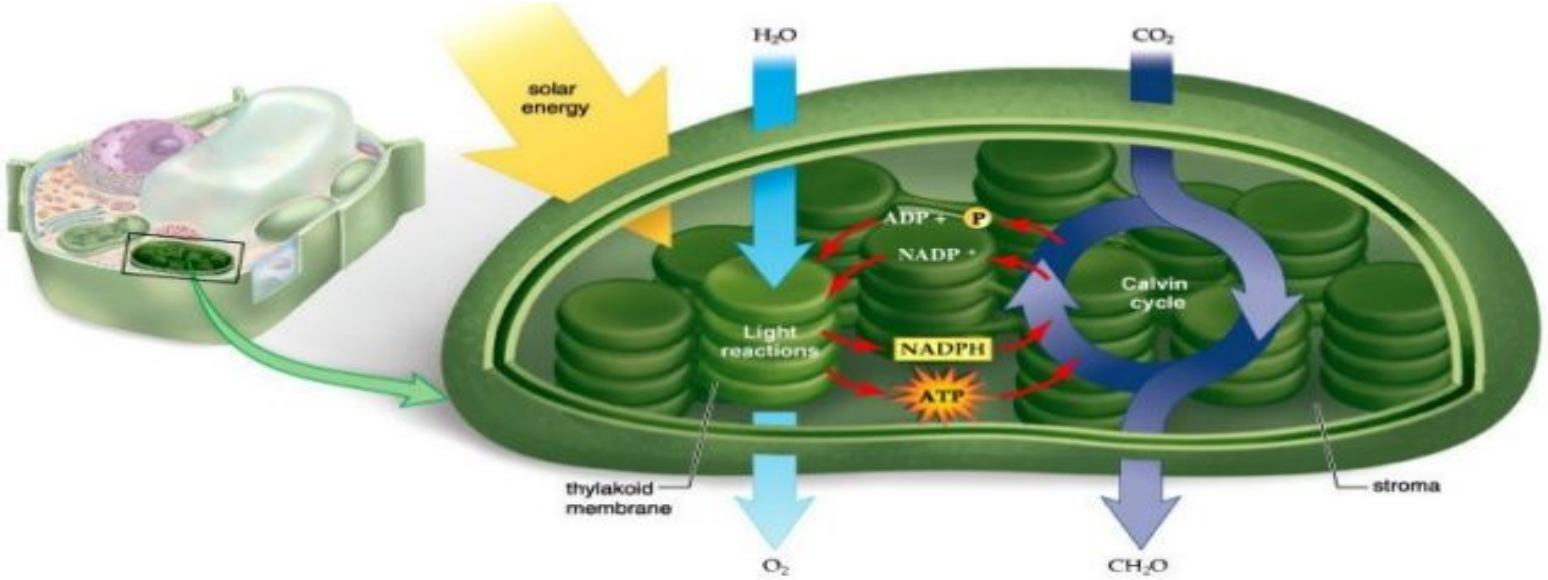
8.3 The Reaction of Photosynthesis

Light-dependent reactions

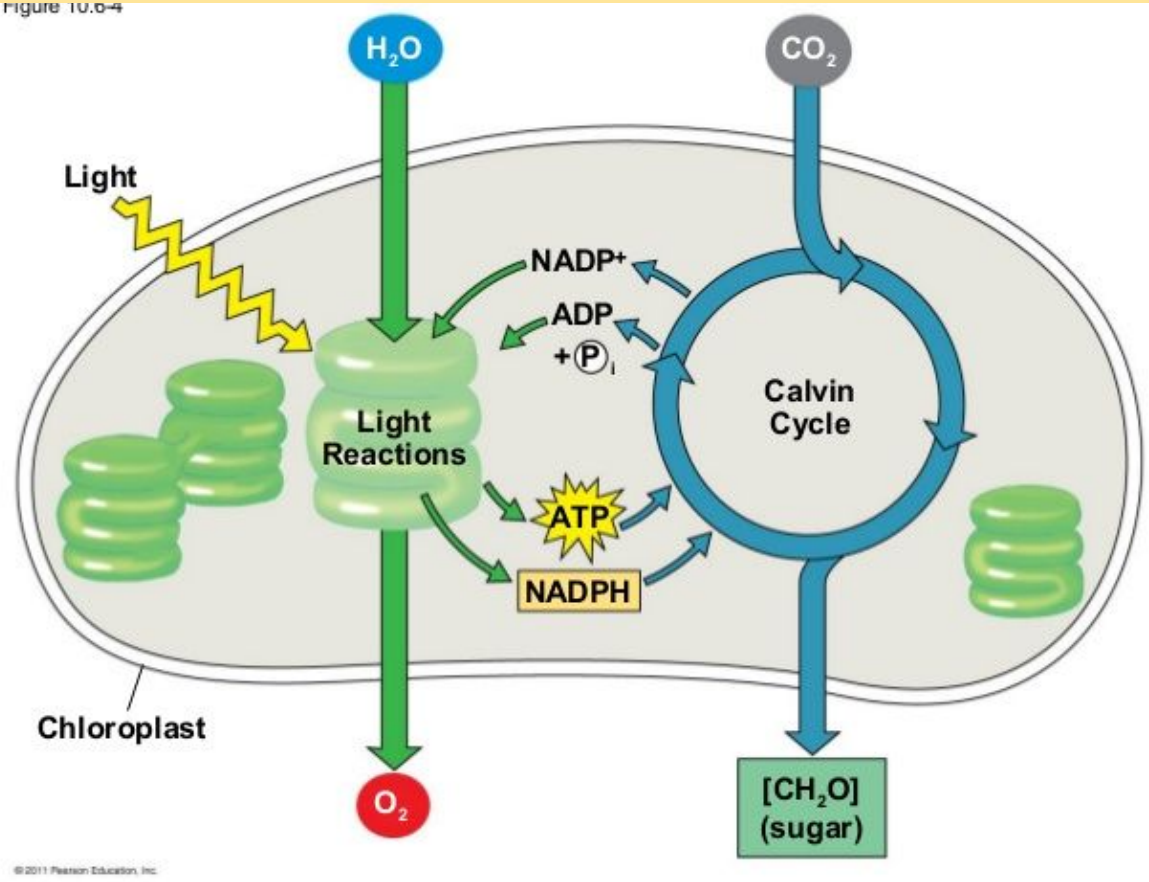
Take place in the thylakoids

Light-independent "dark" reactions (Calvin cycle)

Take place in the stroma



Light Dependent Reactions



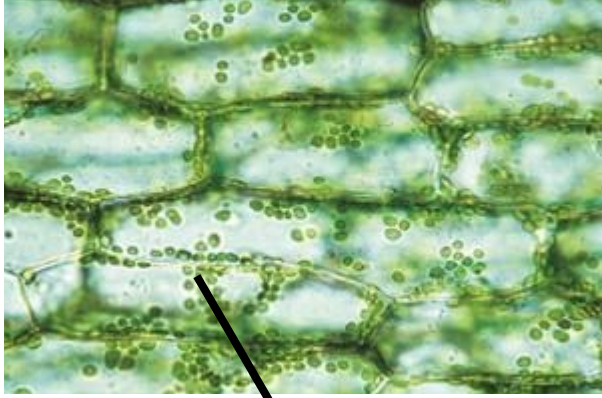
Light-dependent reactions require light

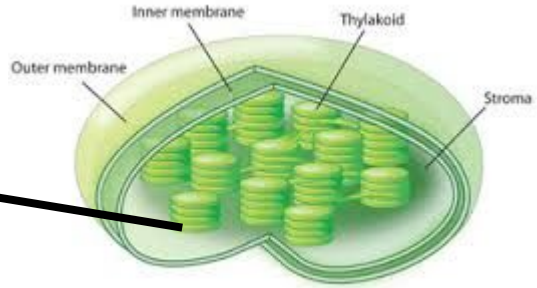
produce oxygen and convert

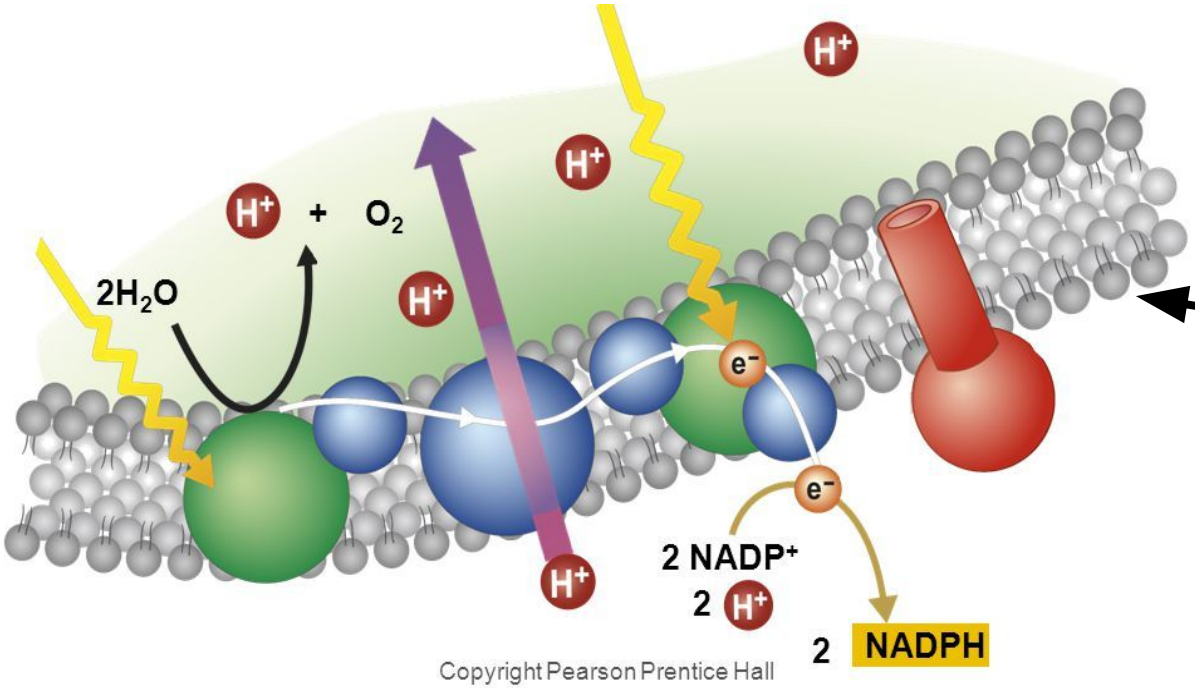
- ADP → ATP
- NADP+ → NADPH

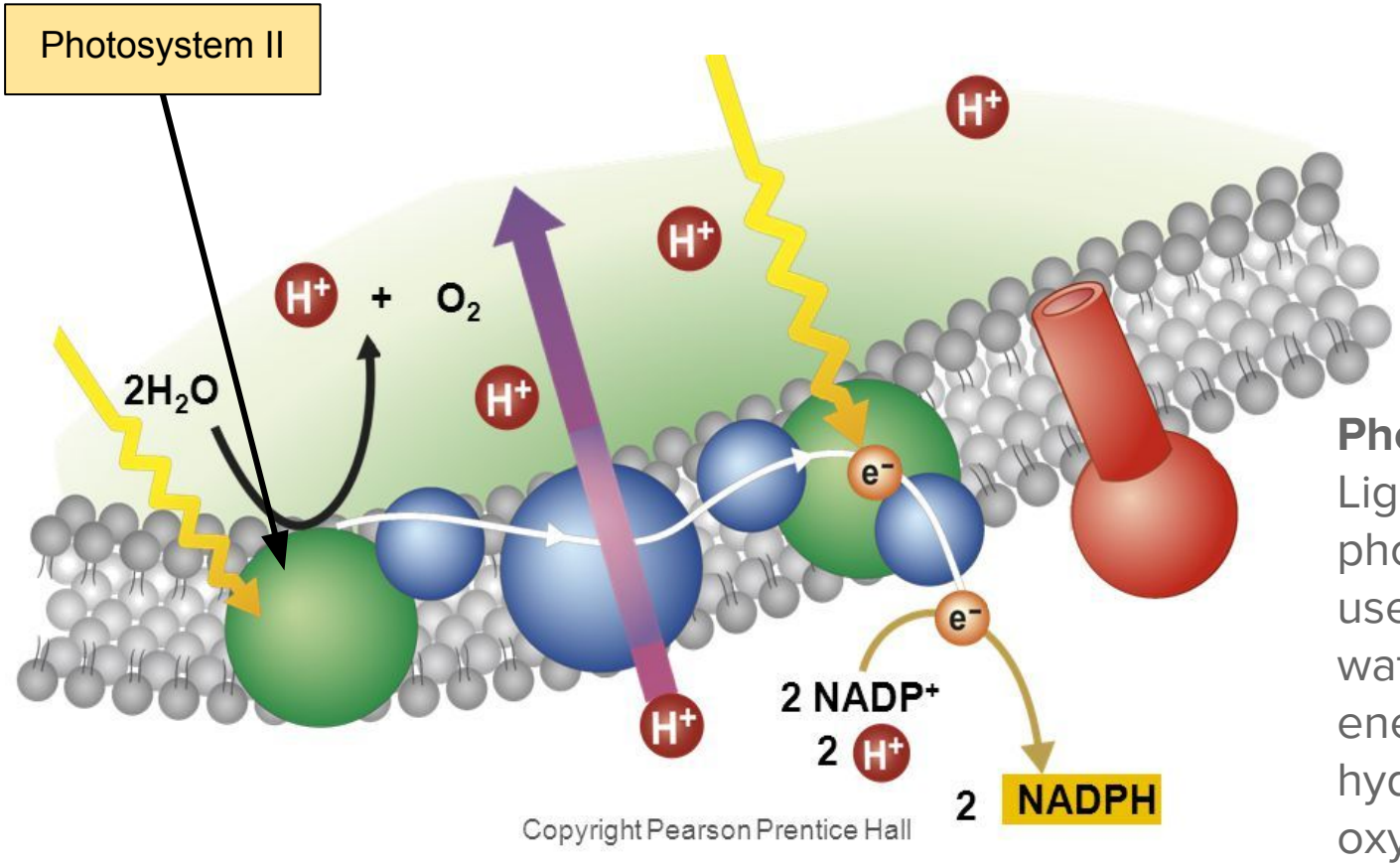
Light-dependent reactions

Light-dependent reactions take place in the thylakoid membrane of the chloroplast organelle

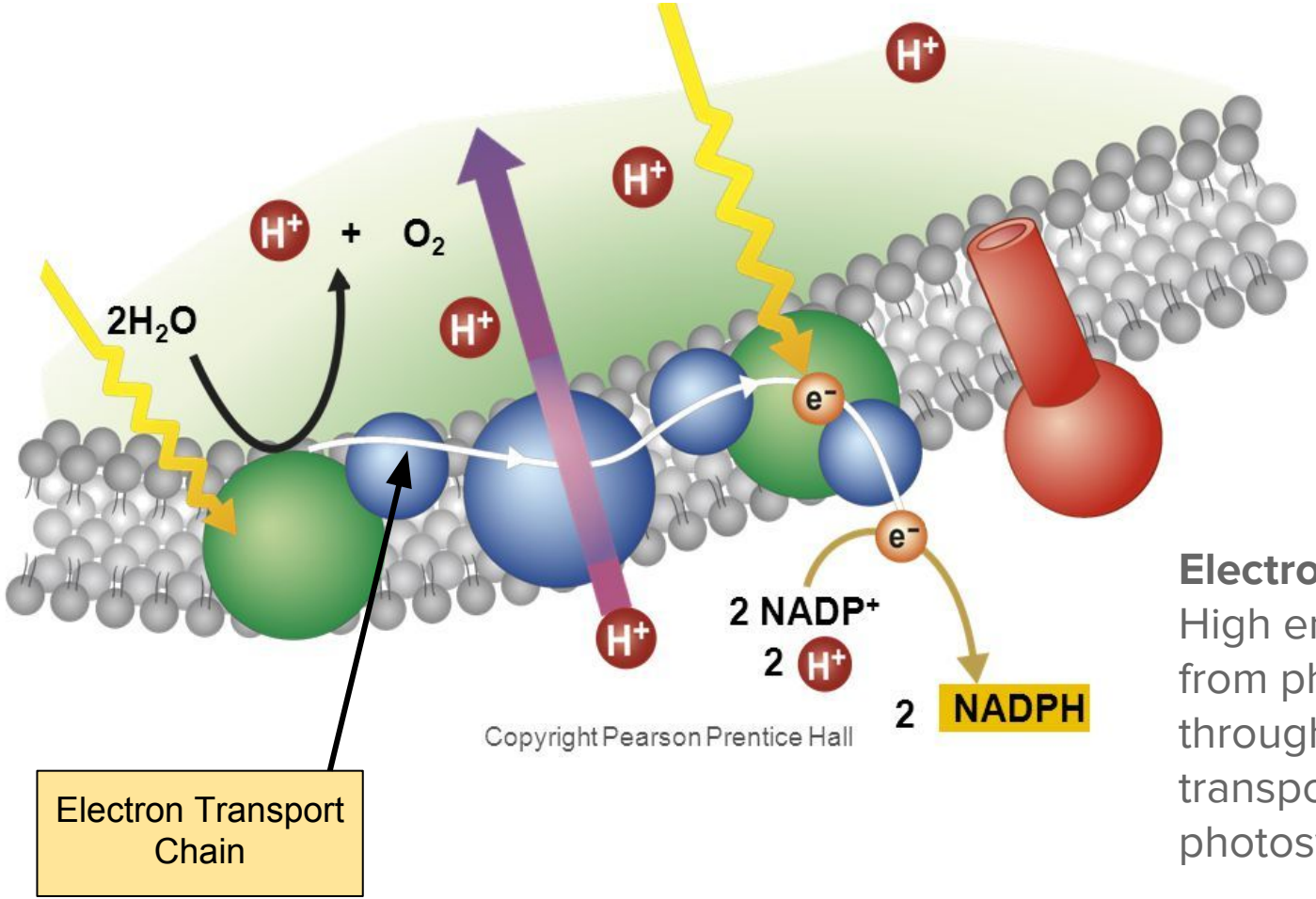




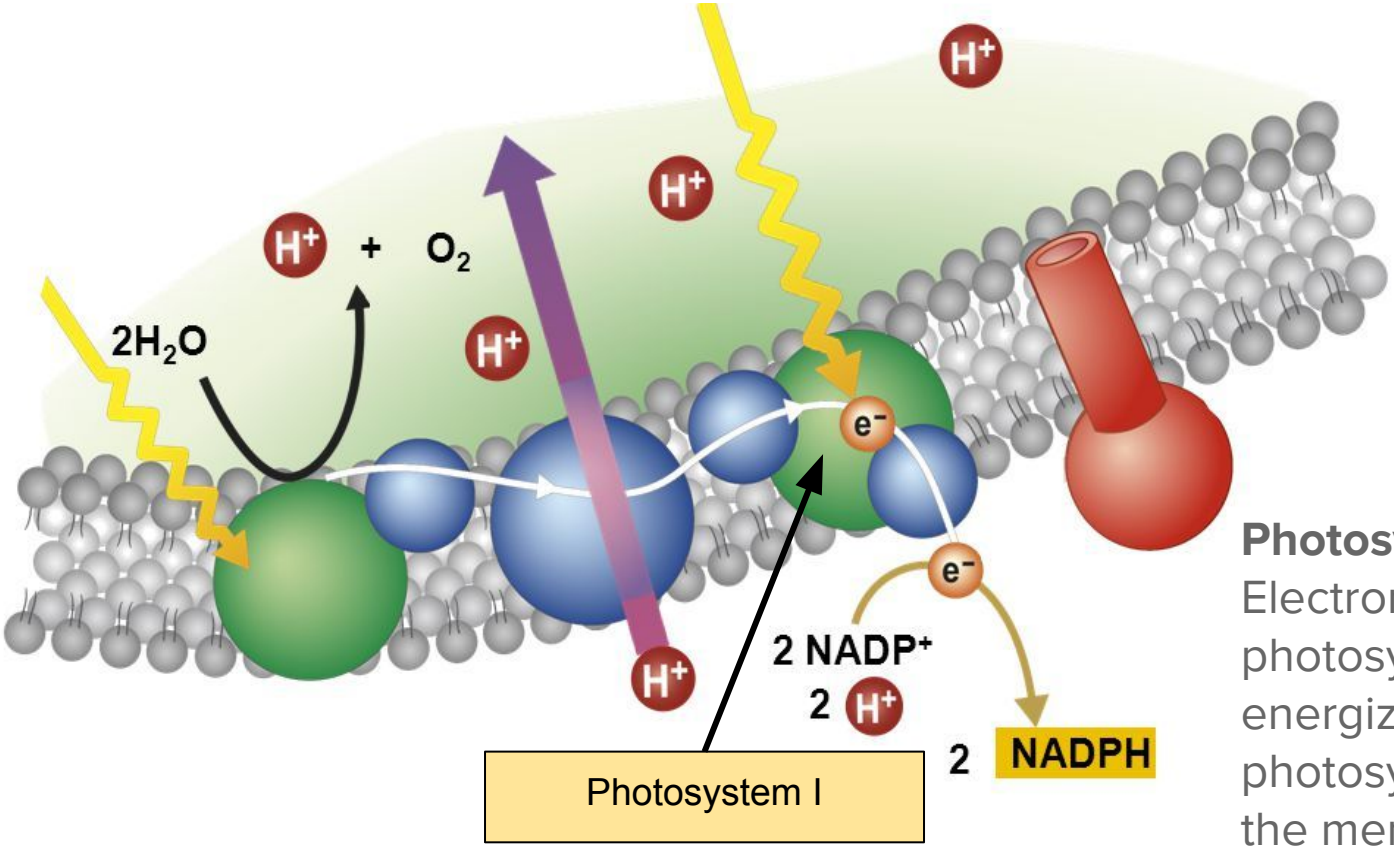




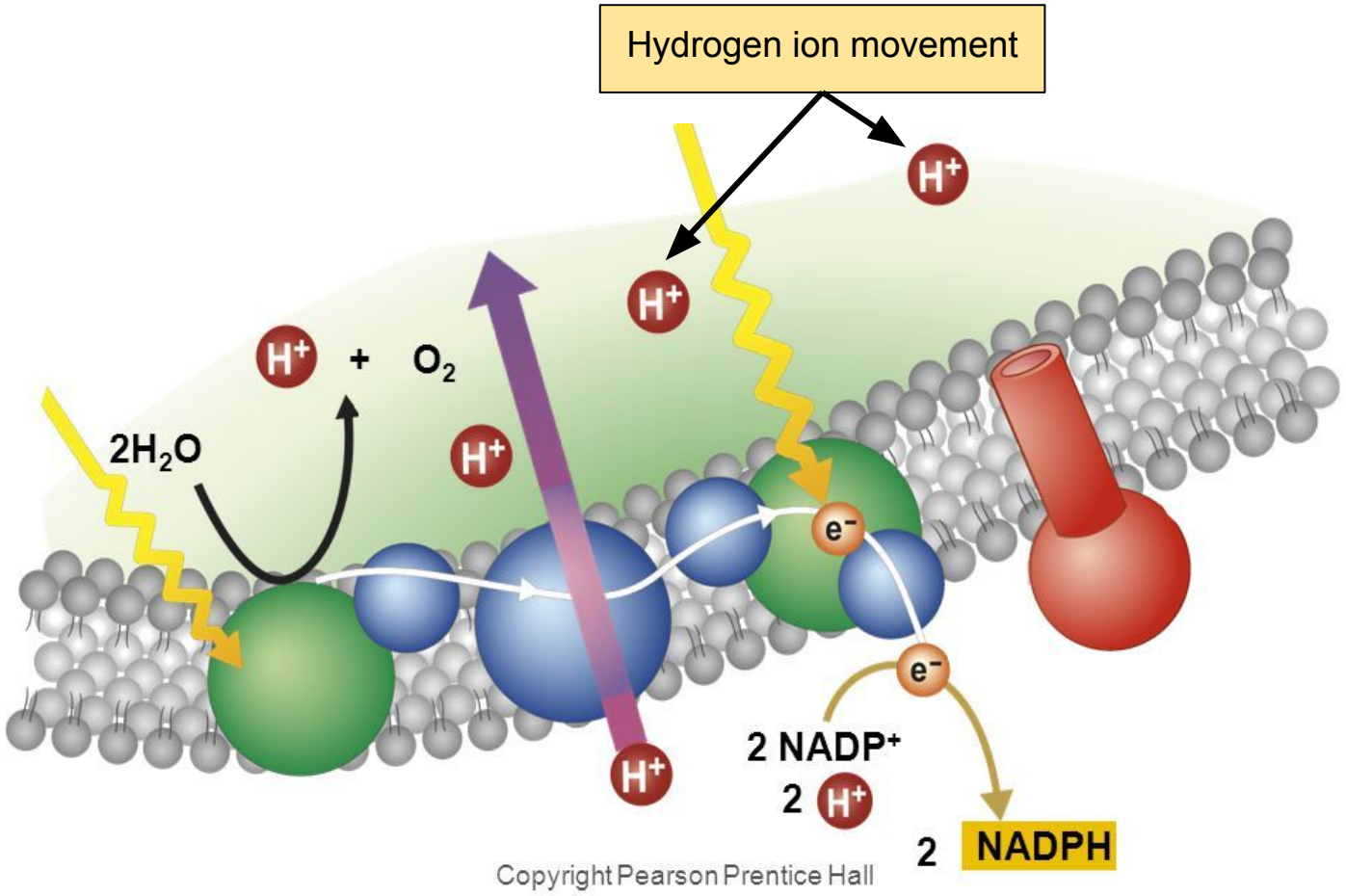
Photosystem II- Light absorbed by photosystem II is used to break up water molecules into energized electrons, hydrogen ions and oxygen



Electron Transport Chain- High energy electrons from photosystem II move through the electron transport chain to photosystem I

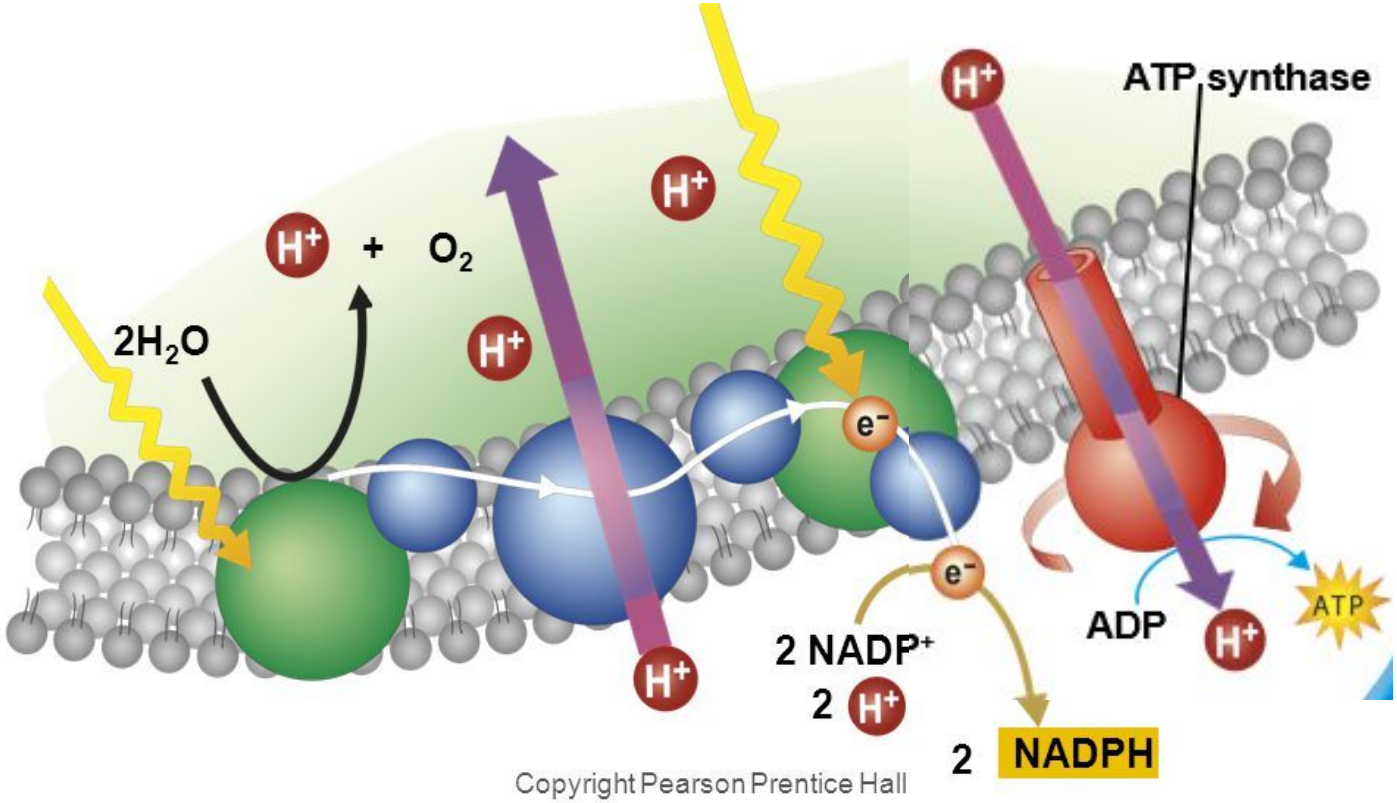


Photosystem I-
Electrons released by photosystem II are energized again in photosystem I. Enzymes in the membrane use the electrons to form NADPH.



Hydrogen Ion Movement-

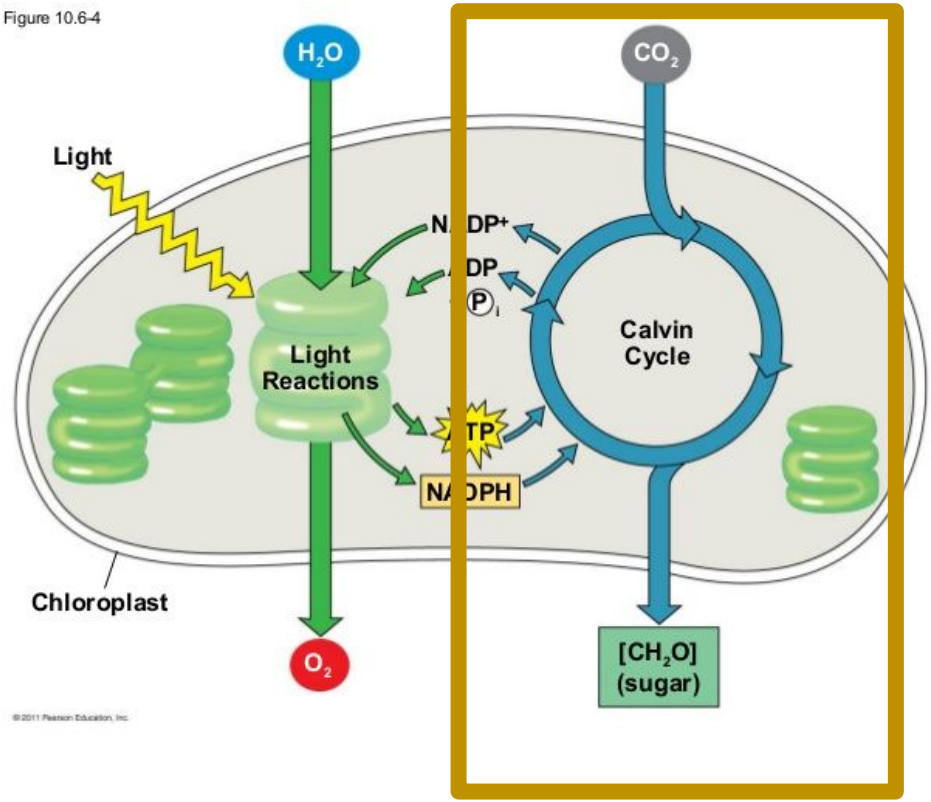
The inside of the thylakoid membrane fills up with positively charged hydrogen ions. This makes the outside of the thylakoid membrane negatively charged



ATP Formation- As hydrogen ions pass through ATP synthase, their energy is used to convert ADP into ATP.

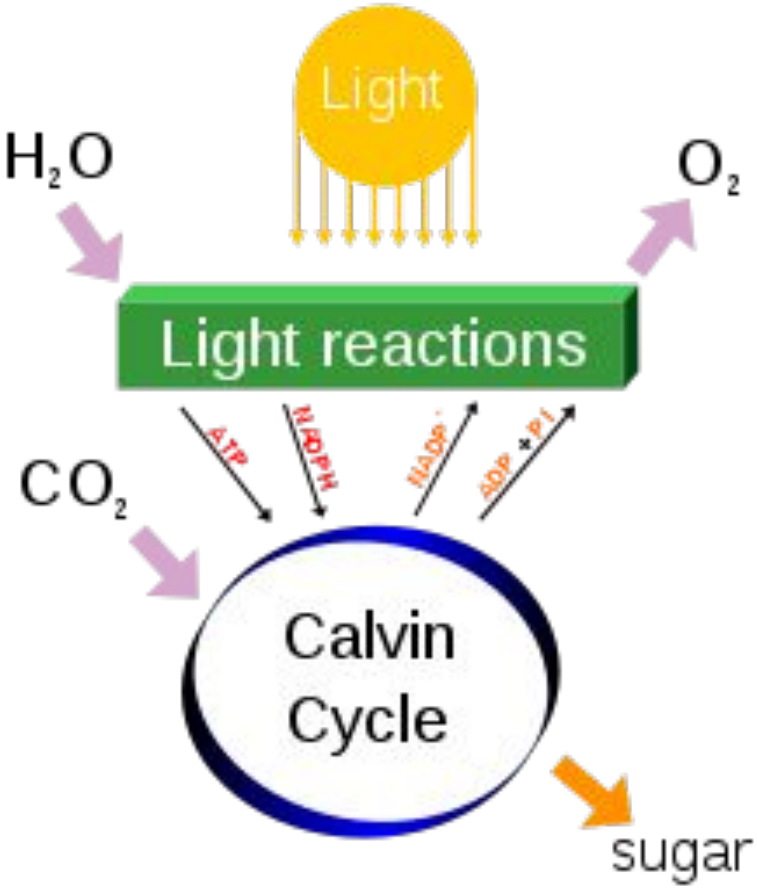
Light Independent Reactions (dark reactions)

The ATP and NADPH formed from the light-dependent reaction contain chemical energy that cannot be stored for very long.



<u>The Calvin cycle</u> (light independent reaction) uses ATP and NADPH to produce **sugar** which can be stored for longer.

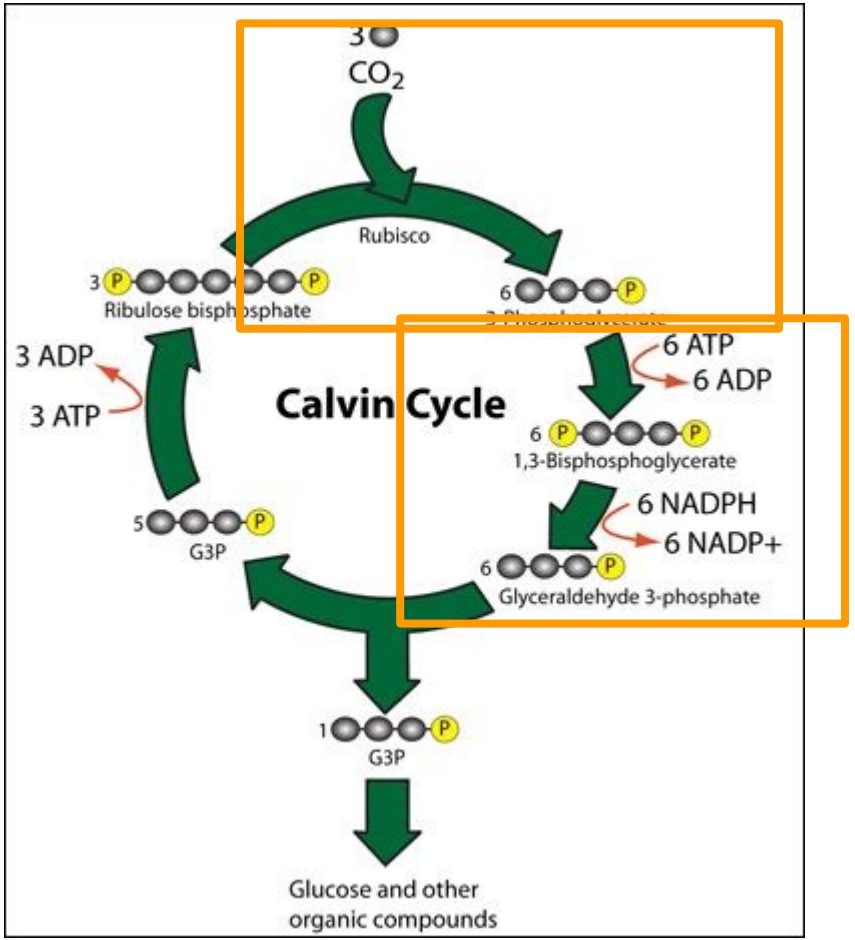
1948: Melvin Calvin was able to identify the chemical path carbon follows to form the sugar glucose. These reactions are now known as the Calvin cycle.



The Calvin cycle does not require light and takes place in the stroma.

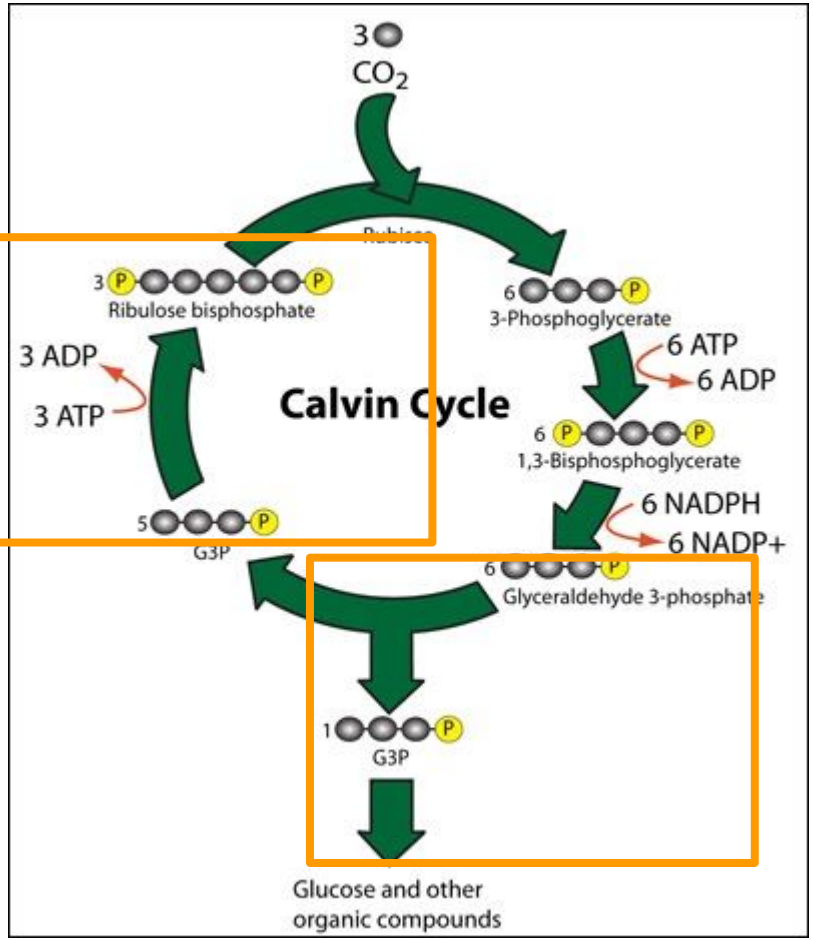
Step 1: 6 carbon dioxide molecules enter from the atmosphere and combine with other carbon to form 12 3-carbon molecules

Step 2: the 12 3-carbon molecules are then converted into higher energy forms. This energy comes from ATP and NADPH



Step 3: two of the 12 3-carbon molecule are removed from the cycle. These are used to produce sugar and other compounds needed for growth.

Step 4: The remaining 10 3-carbon molecules are converted back into 6 5-carbon molecules.
These are joined with the next incoming CO2 to restart the cycle.



The Calvin cycle uses six molecules of carbon dioxide to produce a single 6-carbon sugar molecule.