Energy and photosynthesis

Energy molecules

* highest energy

3. ATP : adenosine triphosphate
   A - P - P ~ P (~ bond = energy)
2. ADP : adenosine diphosphate
   A - P - P
1. AMP : adenosine monophosphate
   A - P

lowest energy

Higher energy

NADPH → lower NADP+

NADH → NAD+

* For a molecule to be high energy it has to gain an electron.

Photosynthesis :

BIG IDEA:

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

Leaf

Stomata - let in CO_2 and O_2 out
roots - bring in H_2O and nutrients
Chlorophyll - absorbs sunlight - green
Carotenoids - red, yellow, orange

* Chlorophyll absorbs light except green. Green is reflected.

Light Dependent Reactions

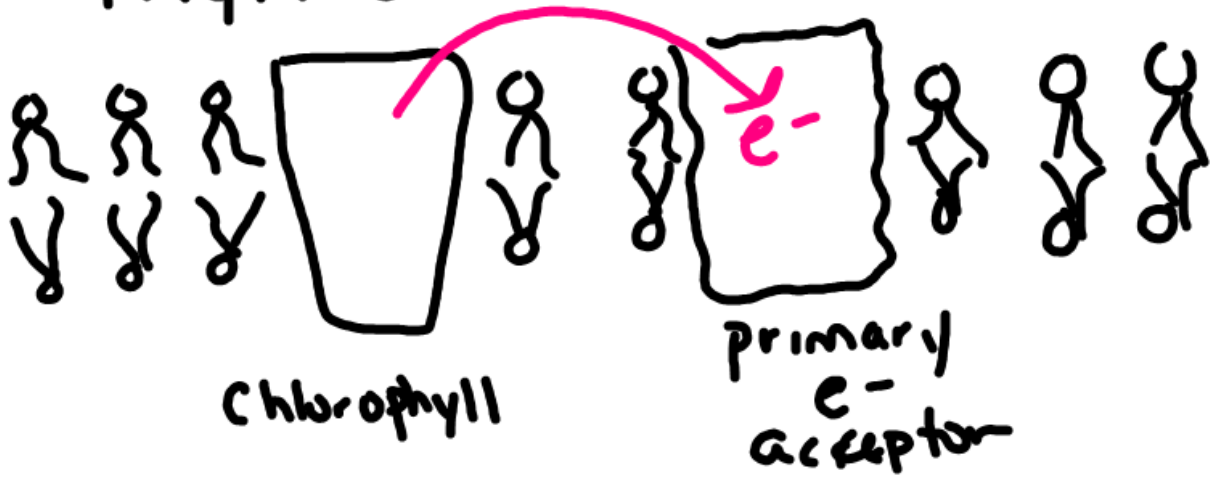
* Need light (photons)
  - Sunlight is captured and changed into an energy storage molecule (ATP)

Autotrophs - plants, algae, some bacteria.

Chloroplasts → thylakoids

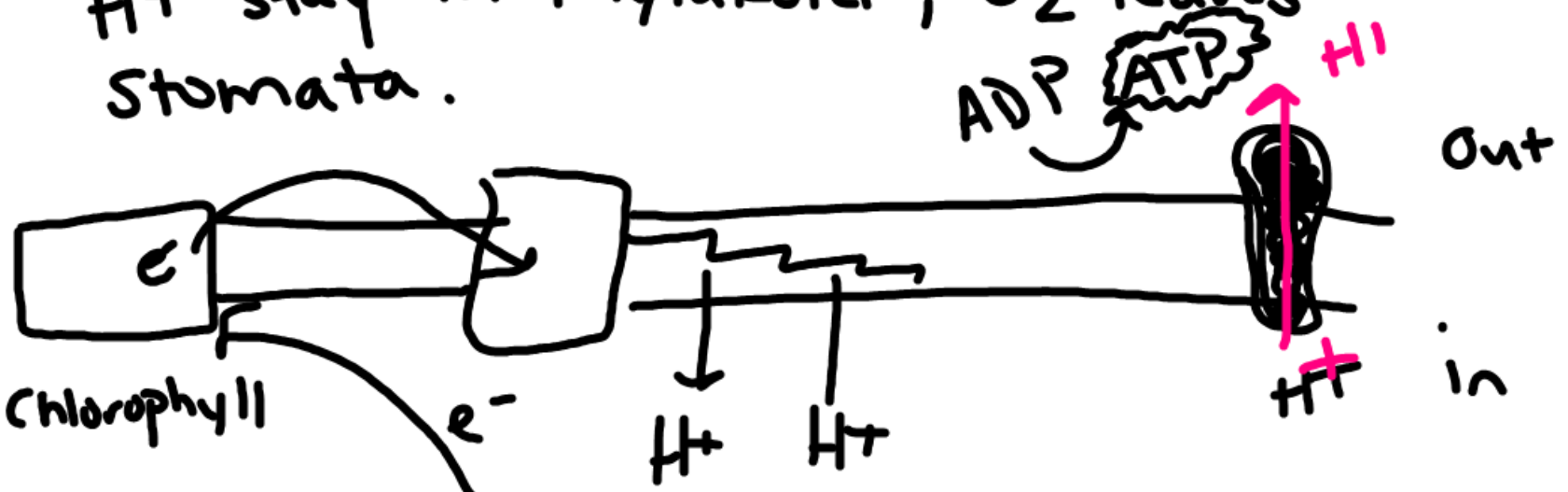
1. Light is absorbed by chlorophyll and other pigments. This causes e^- to become "excited", bumped to a higher energy level.

2. excited e^- moves to the primary electron acceptor in the thylakoid membrane.



3. e^- acceptor puts the e^- into the electron transport chain. As it goes down the chain it loses energy by moving H^+ ions into the thylakoid.

4. e^- that left Chlorophyll must be replaced. splits water (hydrolysis)
e^- go back to Chlorophyll ($2H_2O \rightarrow 4e^-$)
H^+ stay in thylakoid, O_2 leaves stomata.



$O_2 \leftarrow H_2O \rightarrow H^+$

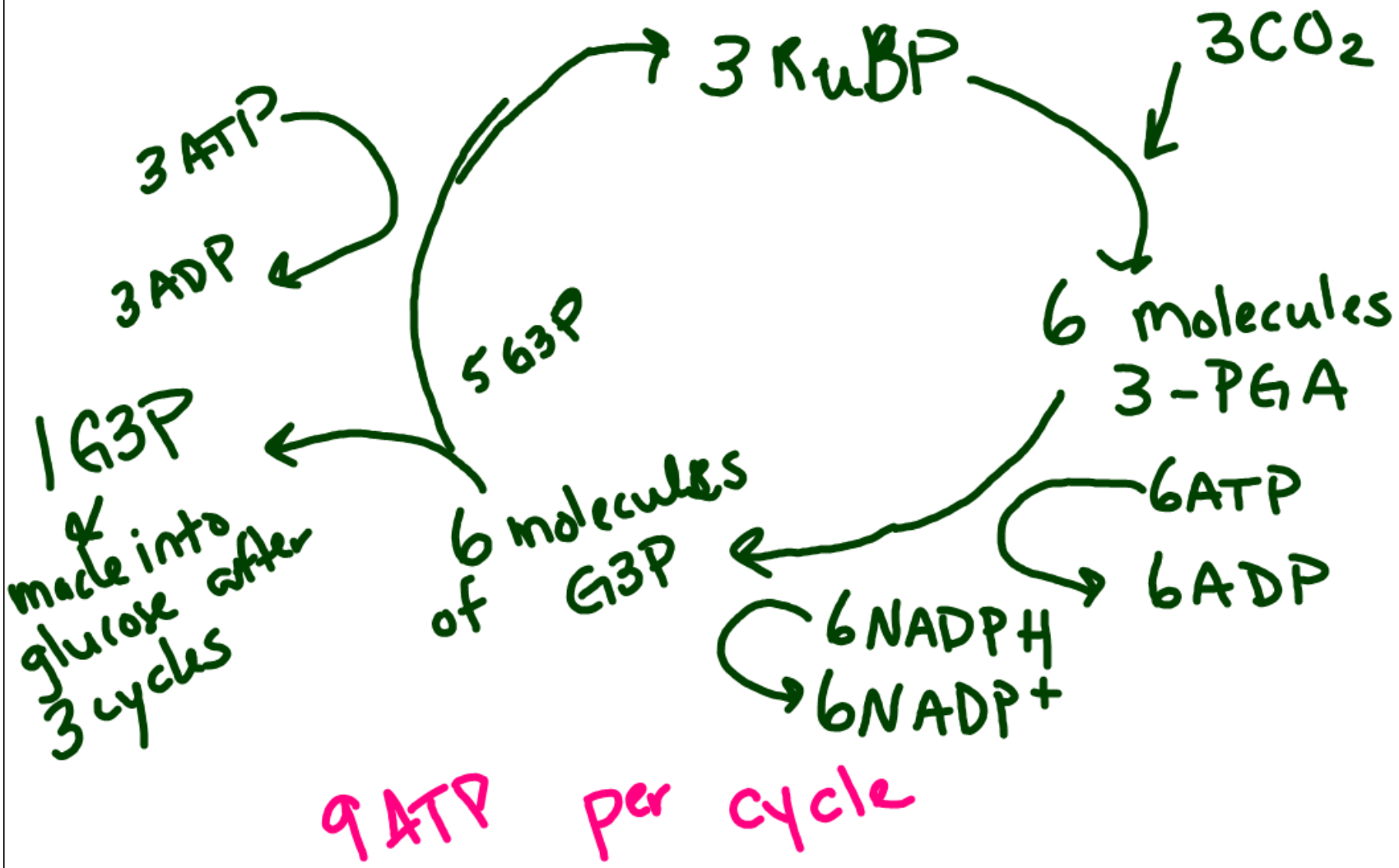
5. H^+ ions are used to make ATP
H^+ move w/ Concentration gradient through ion channel.

Calvin Cycle / dark rxns / light ind. rxn

BIG IDEA: ATP is used to make Glucose

1. CO_2 diffusing into plant cells Combines with 5-carbon molecule RuBP. (unstable)
2. Rearranges into 3-PGA (3-carbons)
3. 3-PGA Changed to G3P molecules with 6 ATPs & 6 NADPH
4. 1 G3P leaves Calvin Cycle (eventually becomes glucose)
5. Remaining G3P converted back to RuBP and start again.

* 3 times through cycle = 1 Glucose



9 ATP per cycle