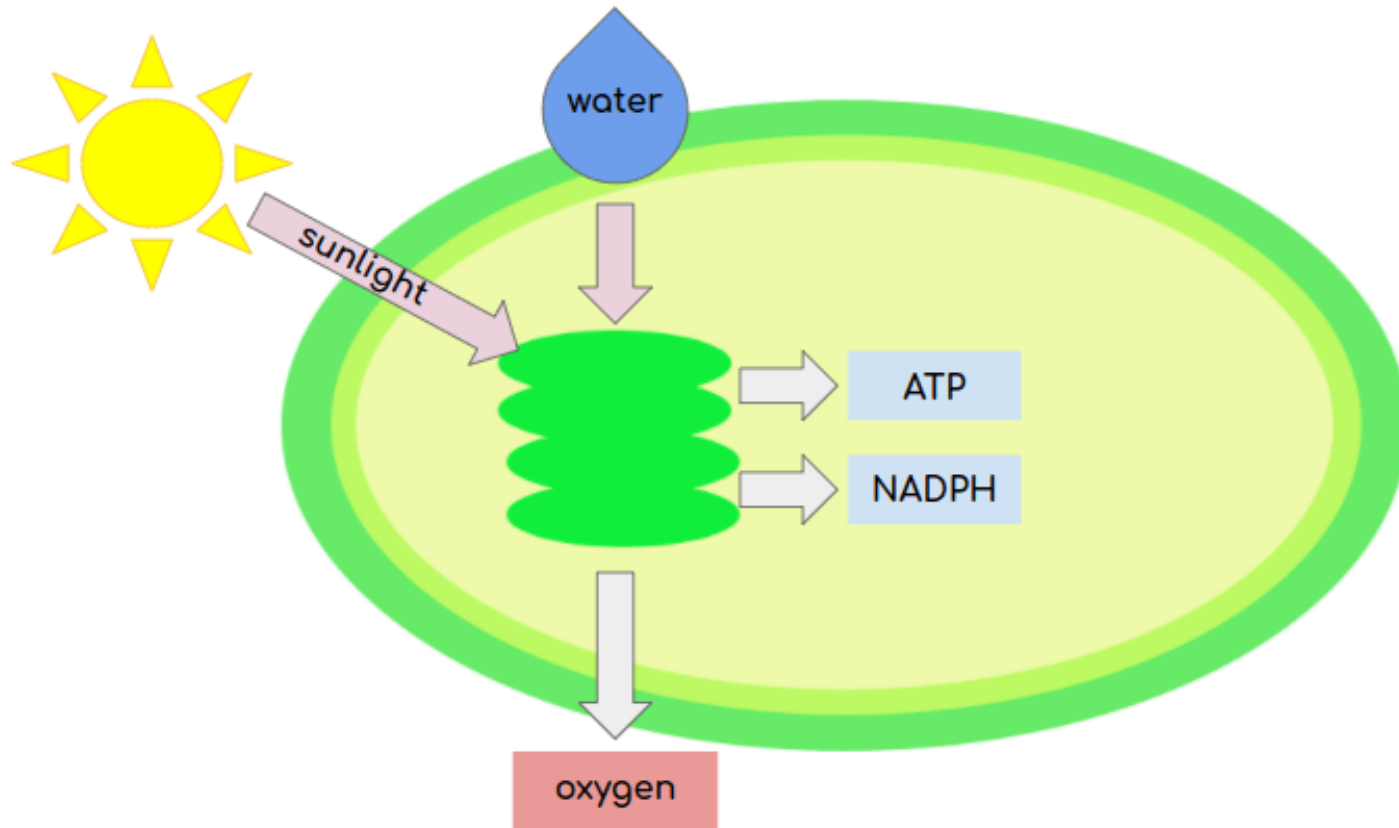


# Pathways of Photosynthesis

## Light-Independent Reactions

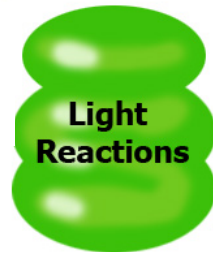
### 8.3



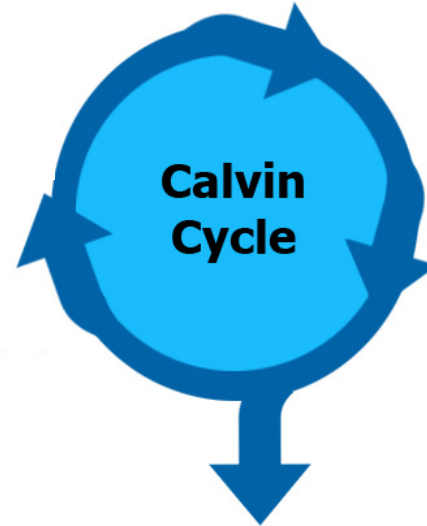
# Recall

## Two Stages of Photosynthesis

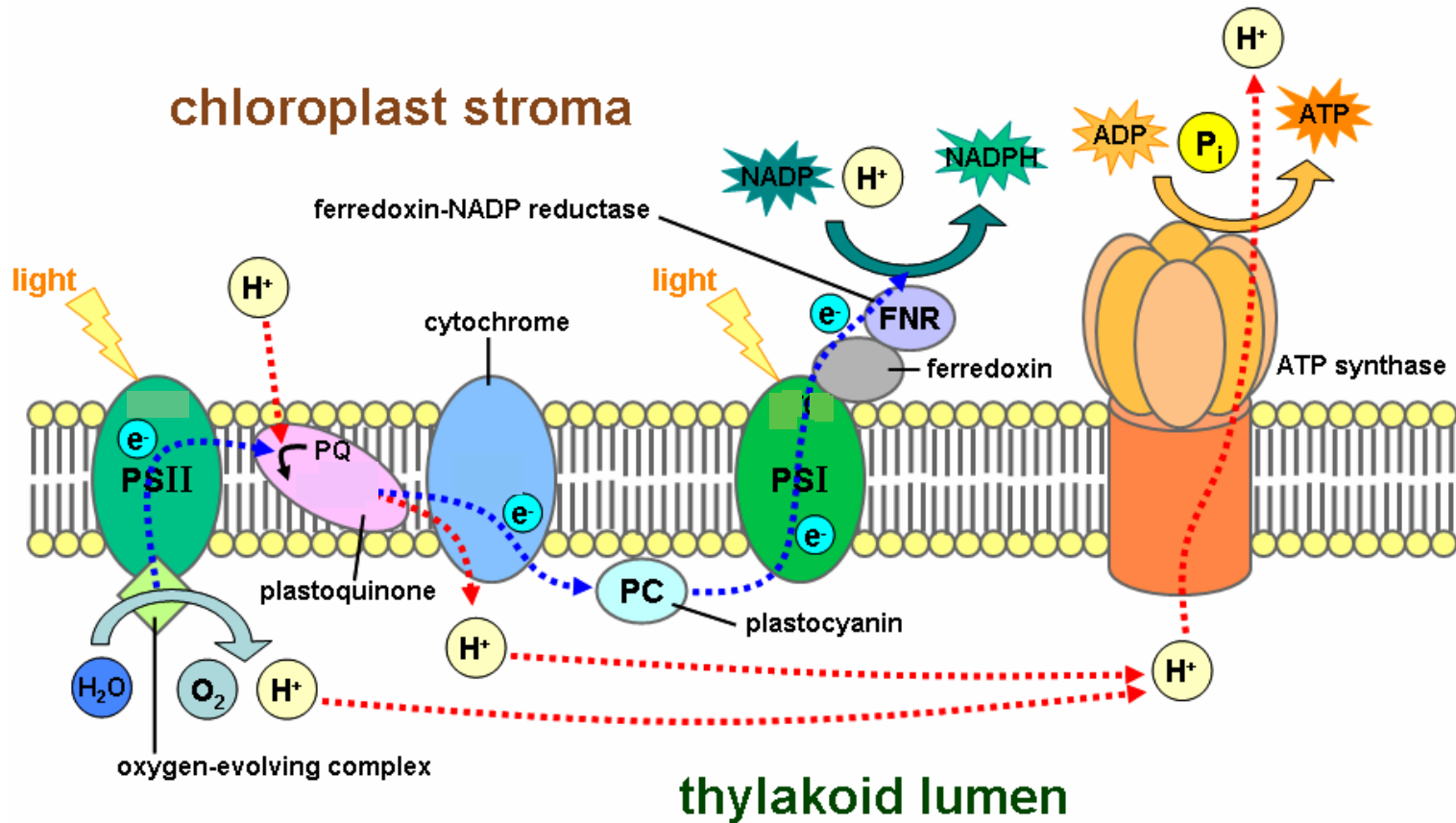
**Light Reaction**  
(light dependent rxn)



**Calvin Cycle**  
(light independent reaction)

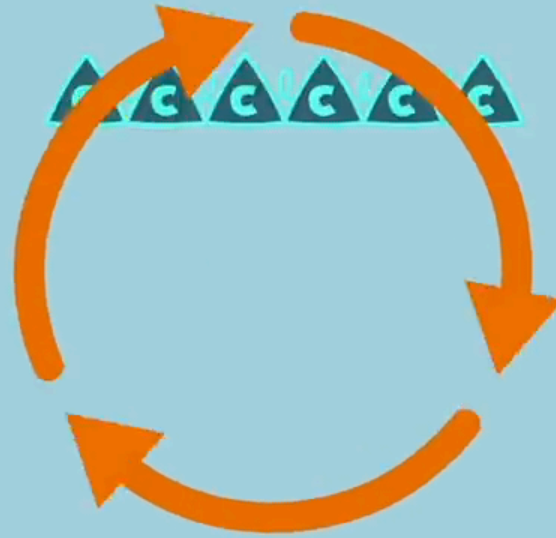


# Light Reactions Recap



# Light Independent Reaction → Calvin Cycle

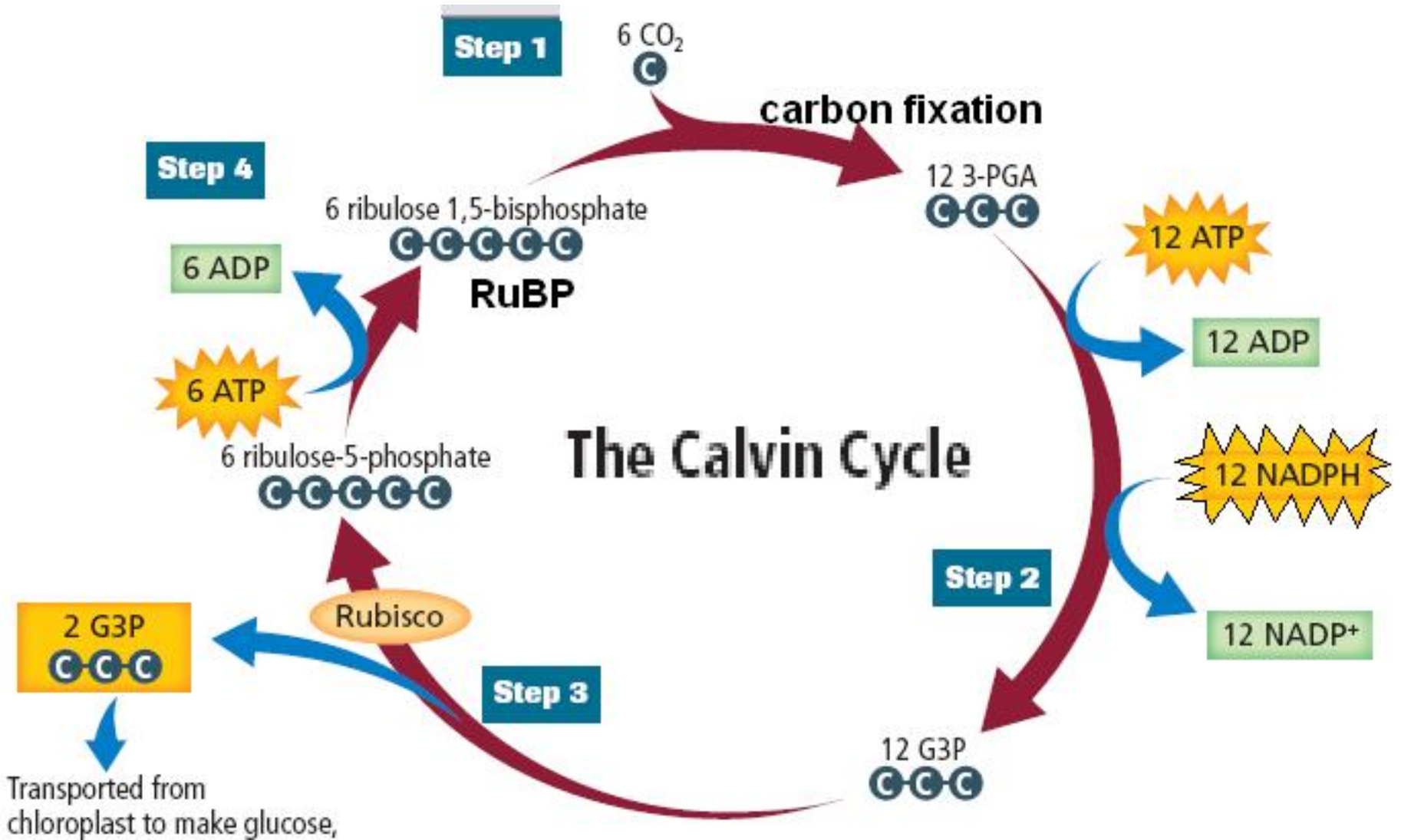
- The reaction occurs in the stroma
- enzyme-catalyzed reactions
- 3 phases
  - carbon fixation (CO<sub>2</sub> added) by Rubisco enzyme
  - reduction reactions (ATP and NADPH from light reaction are used)
  - RuBP regeneration



# The Calvin Cycle

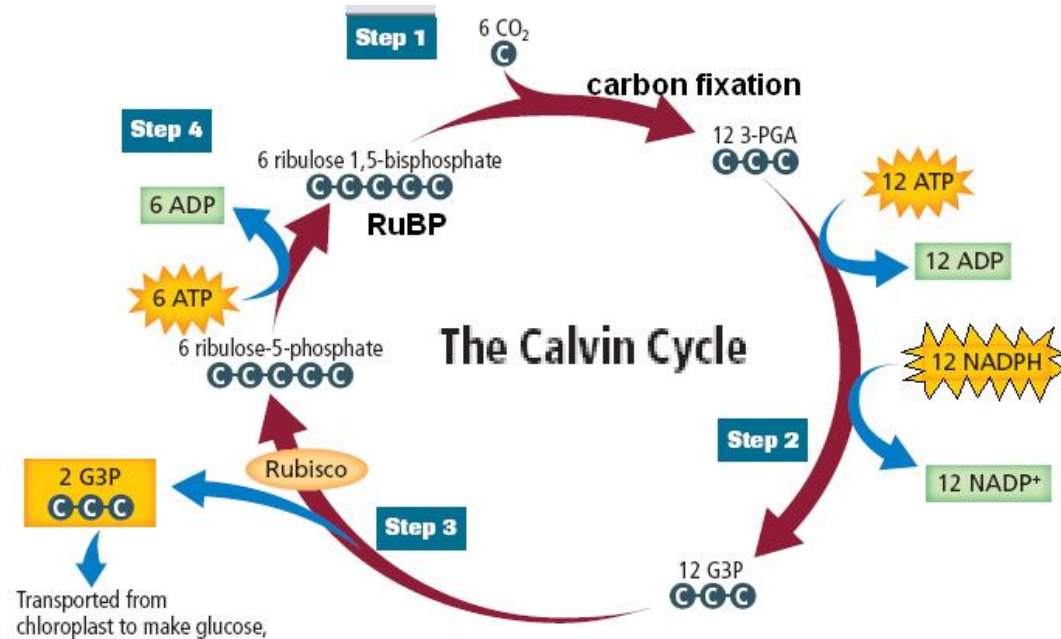
# Main Point of Calvin Cycle

- 6 Ribulose biphosphate (RuBP) a five carbon compound is bound to an incoming 6 carbon dioxides (**Carbon Fixation** by **Rubisco** enzyme) = six 6-carbon compound
- The unstable six carbon compound is split into two 3-carbon compounds called phosphoglycerates or PGA (total = 12)
- 12 ATP and 12 NADPH reduce the 12 PGA into G3P's
- 2 G3P's make a sugar phosphate, 10 regenerate the 6 RuBP using 6 ATP's
- Cycle starts again...



# Calvin Cycle

- for every 6  $\text{CO}_2$  molecules that enter the Calvin cycle, 12 G3P molecule are produced
- 10 G3P molecules are used to regenerate the original 6 RuBP
- 2 other G3P leave the chloroplast to make sugar





# Animations

- Animation of Calvin cycle:

[http://www.science.smith.edu/  
departments/Biology/Bio231/calvin.html](http://www.science.smith.edu/departments/Biology/Bio231/calvin.html)

# Energy Requirements

- for every 1 G3P molecule that comes out of the Calvin cycle, 9 ATP and 6 NADPH are needed

