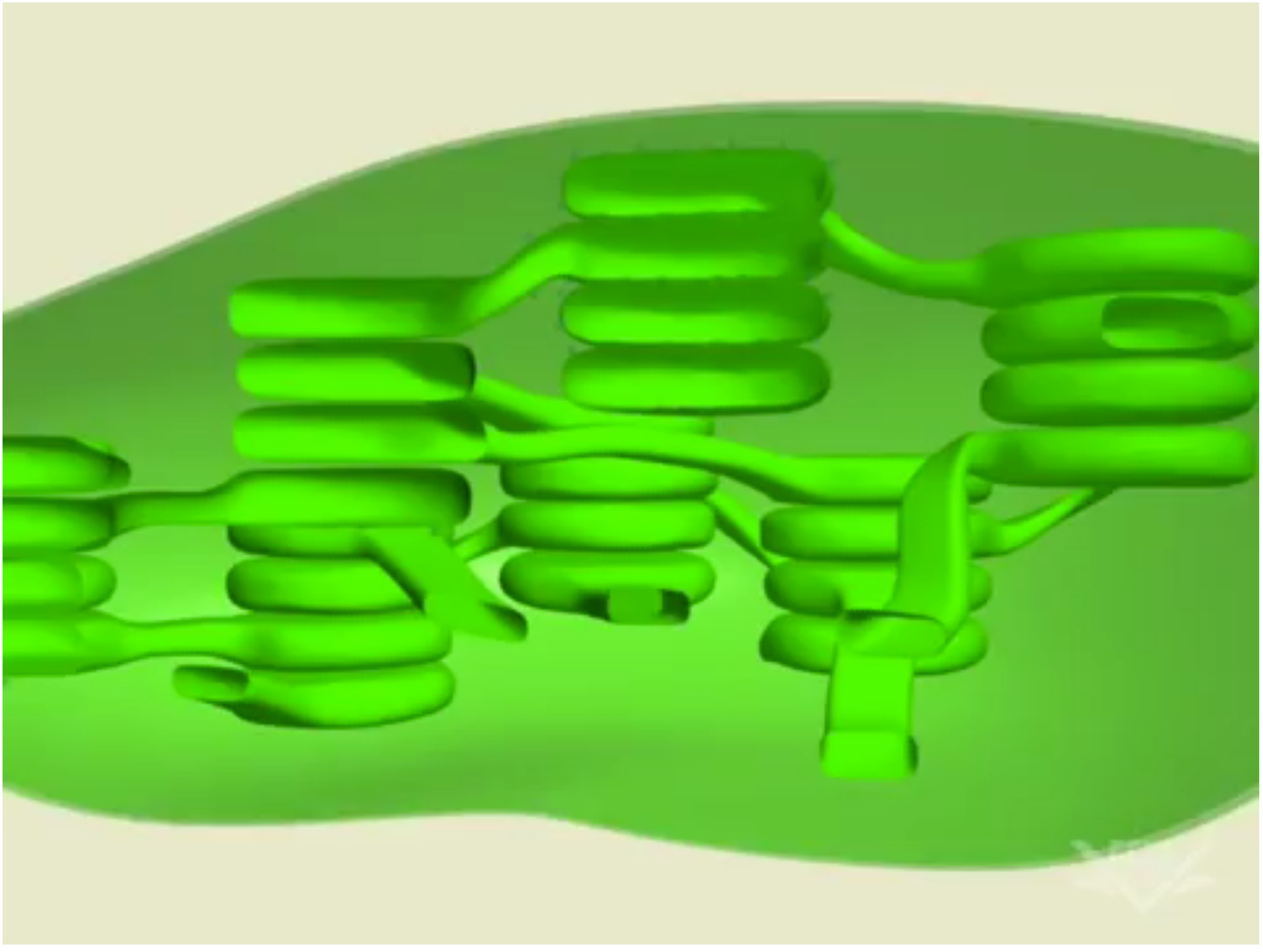
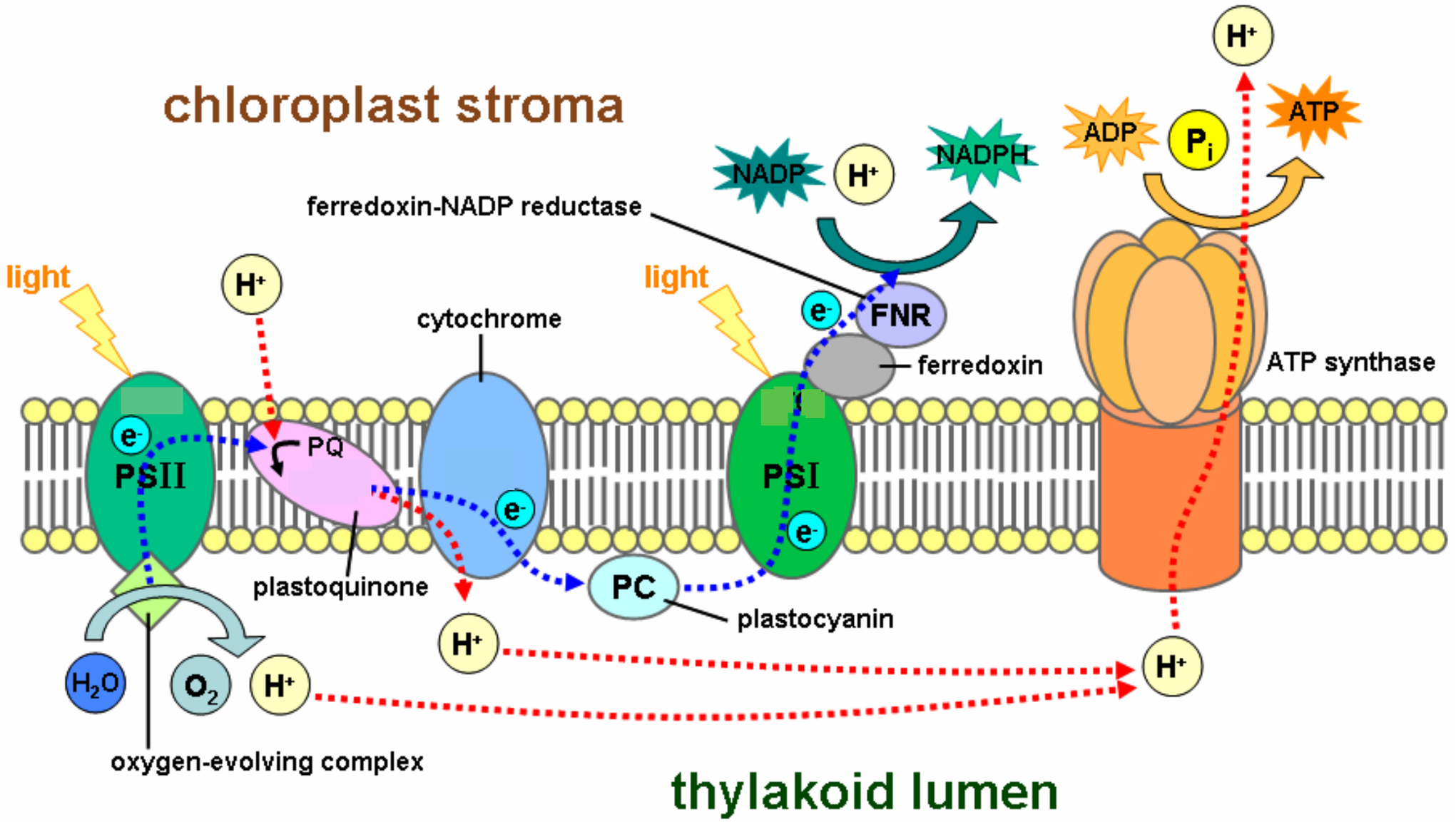
Friday



Light Reactions Recap



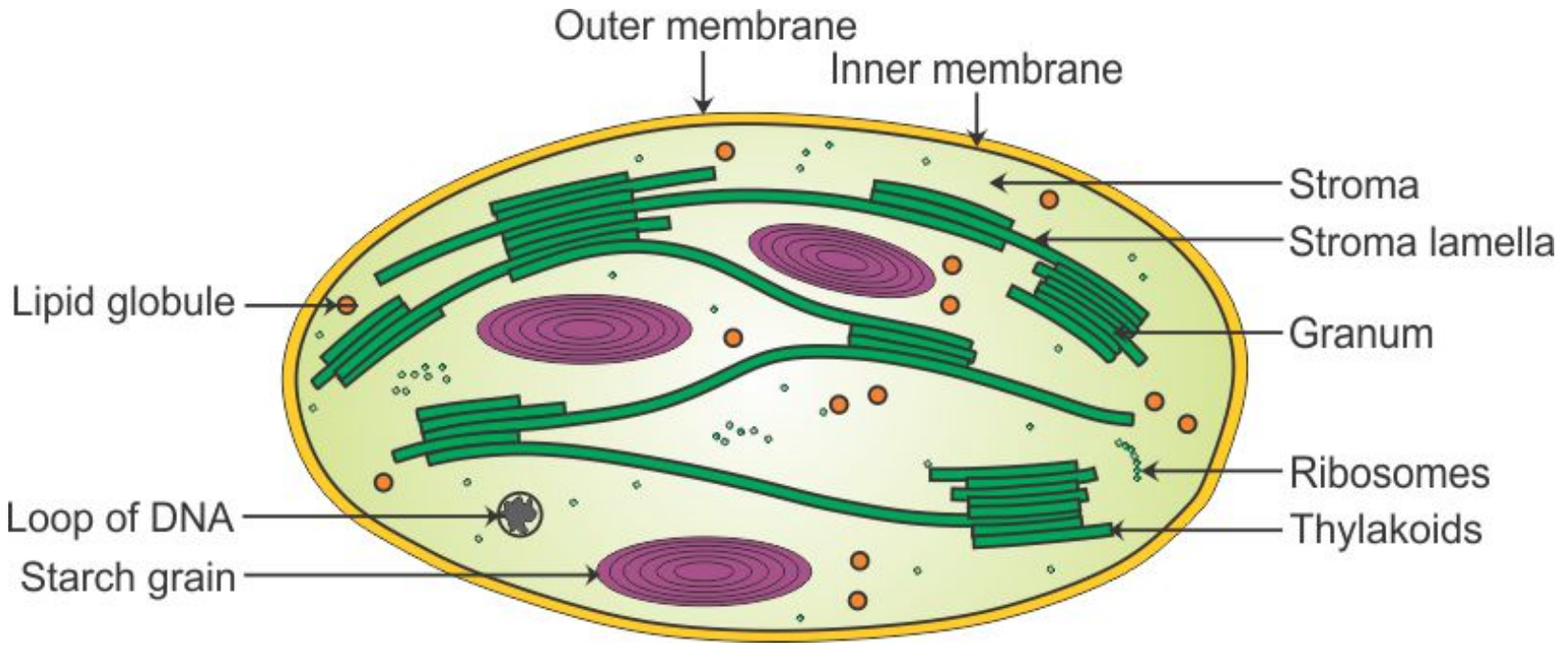
Warm-up

Explain the final products of the two photosystems involved in the light dependent reaction of photosynthesis

Warm-up

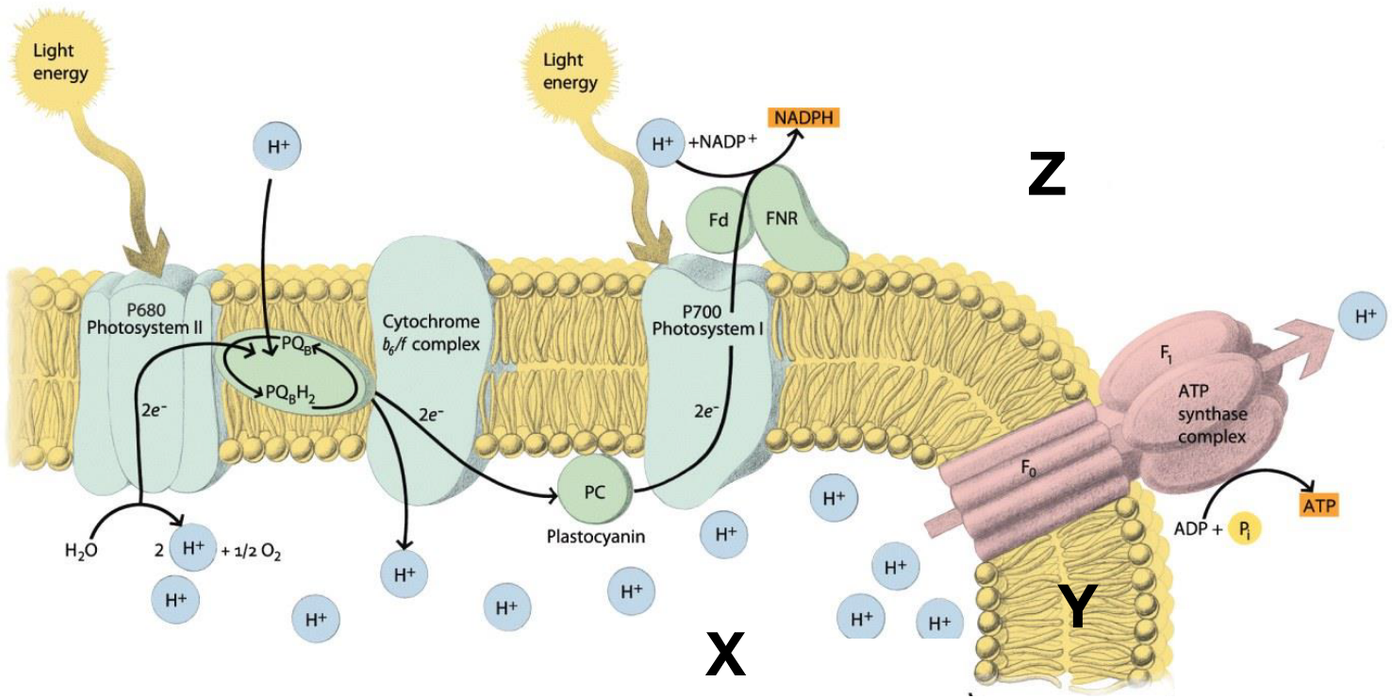
Why do plants need mitochondria and chloroplasts?

Warm-up



What evidence here from the diagram of a chloroplast supports the theory of endosymbiosis?

Warm-up



a. State the names is X , Y and Z? What happens in each?

b. What do you think the advantage of X having a small volume is for?

Warm-up

Which of the following statements about the light dependent reactions is correct?

a. Photoactivation of photosystem I causes photolysis

b. Cyclic phosphorylation involves both photosystem I and photosystem II

c. Electrons from the photolysis of water are transferred to NADP+ from photosystem I

d. NADP+ becomes oxidized when it combines with the electrons and protons

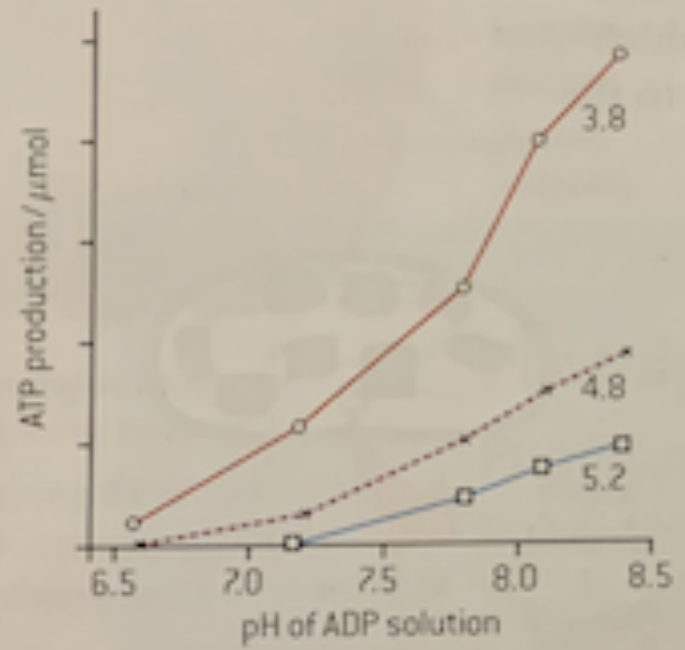
Warm-up

- In your Groups Work, on DATA BASED questions on 394
- You have 10 min.

Warm-up

Data-based questions: Evidence for chemiosmosis

One of the first experiments to give evidence for ATP production by chemiosmosis was performed in the summer of 1966 by André Jagendorf. Thylakoids were incubated for several hours in darkness, in acids with a pH ranging from 3.8 to 5.2. The lower the pH of an acid, the higher its concentration of protons. During the incubation, protons diffused into the space inside the thylakoids, until the concentrations inside and outside were equal. The thylakoids were then transferred, still in darkness, into a solution of ADP and phosphate that was more alkaline. There was a brief burst of ATP production by the thylakoids. The graph shows the yield of ATP at three acid incubation pHs and a range of pHs of the ADP solution.



▲ Figure 6 Results of Jagendorf experiment

1 **a)** Describe the relationship between pH of ADP solution and ATP yield, when acid incubation was at pH 3.8. [2]

b) Explain why the pH of the ADP solution affects the ATP yield. [2]

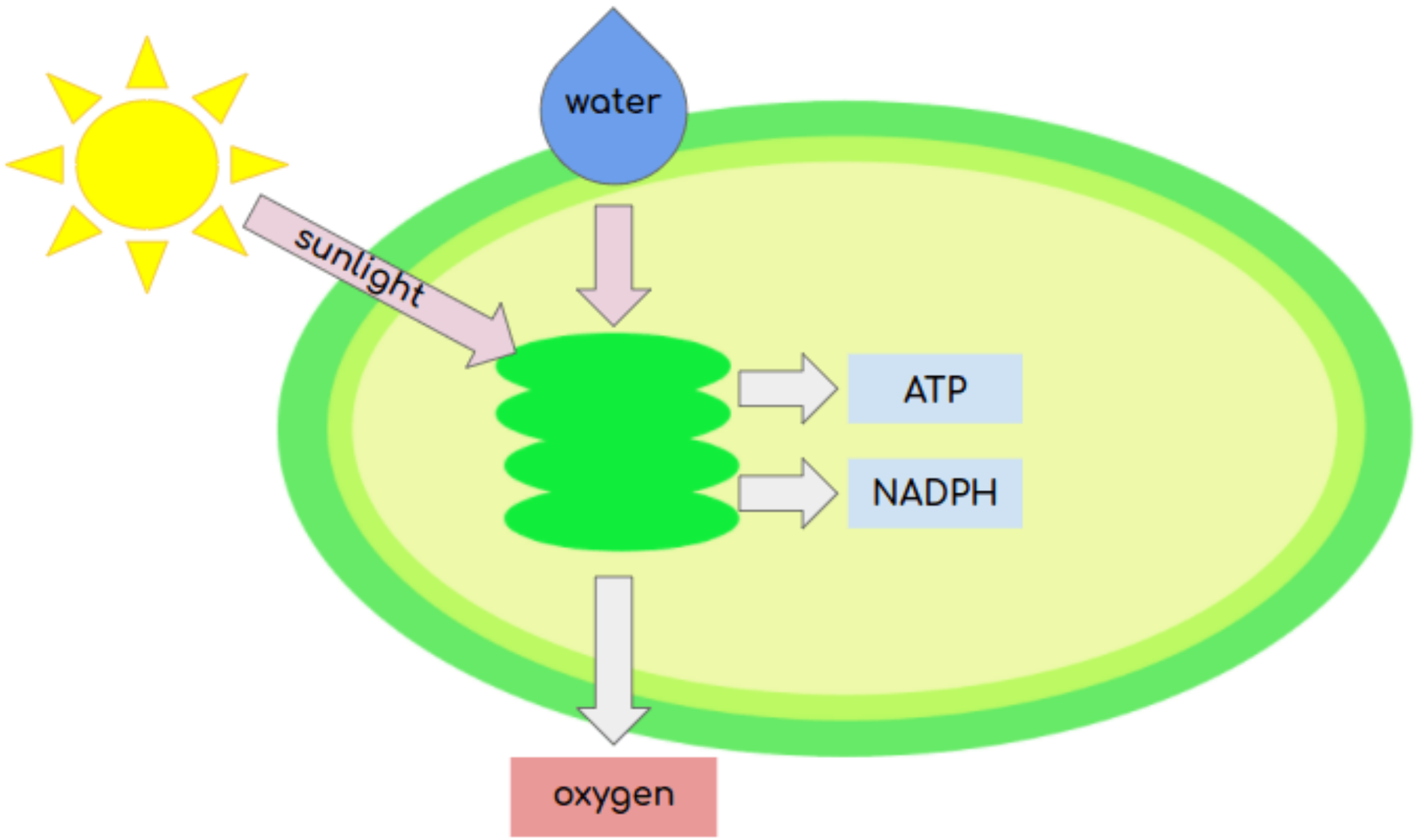
2 Explain the effect of changing the pH of acid incubation on the yield of ATP. [2]

3 Explain why there was only a short burst of ATP production. [2]

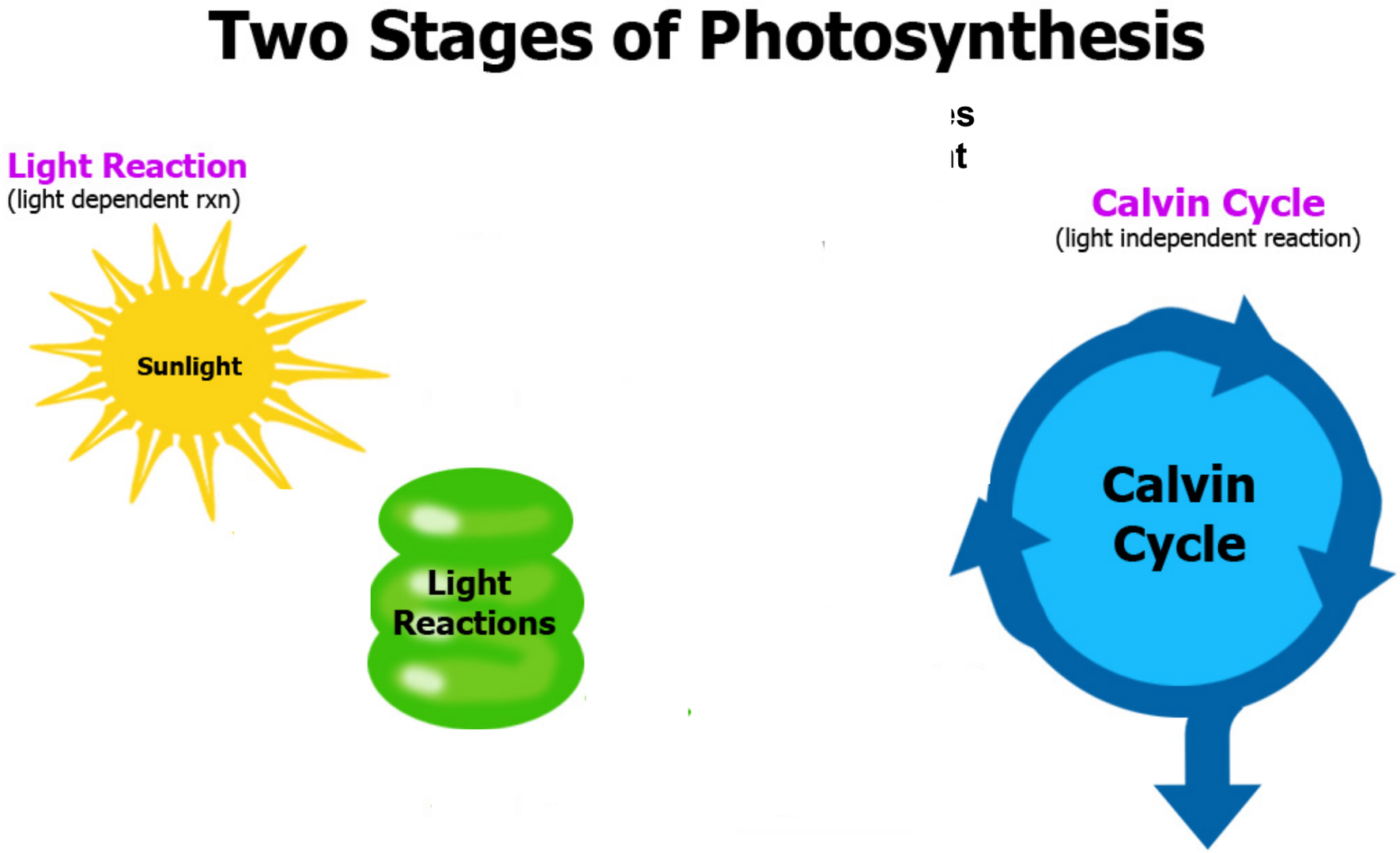
4 Explain the reason for performing the experiment in darkness. [2]

Pathways of Photosynthesis
Light-Independent Reactions

8.3

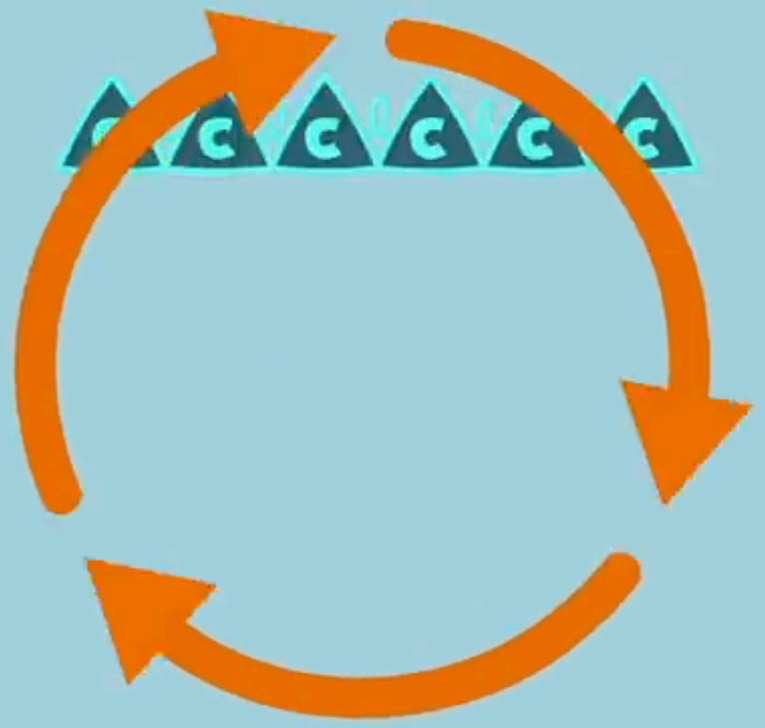


Recall



Light Independant Reaction —> Calvin Cycle

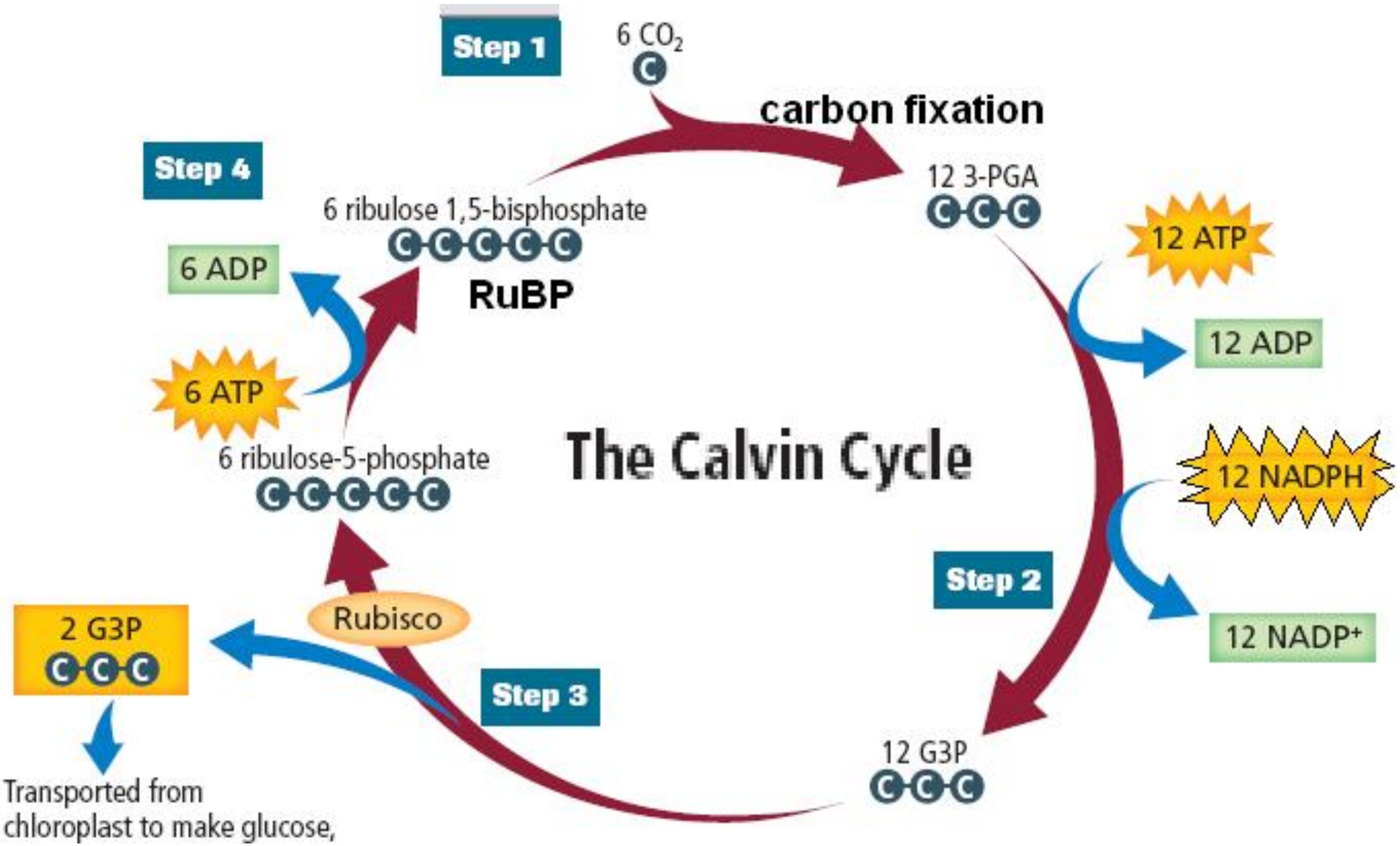
- The reaction occurs in the stroma
- enzyme-catalyzed reactions
- 3 phases
  - carbon fixation (CO_2 added) by Rubisco enzyme
  - reduction reactions (ATP and NADPH from light reaction are used)
  - RuBP regeneration



The Calvin Cycle

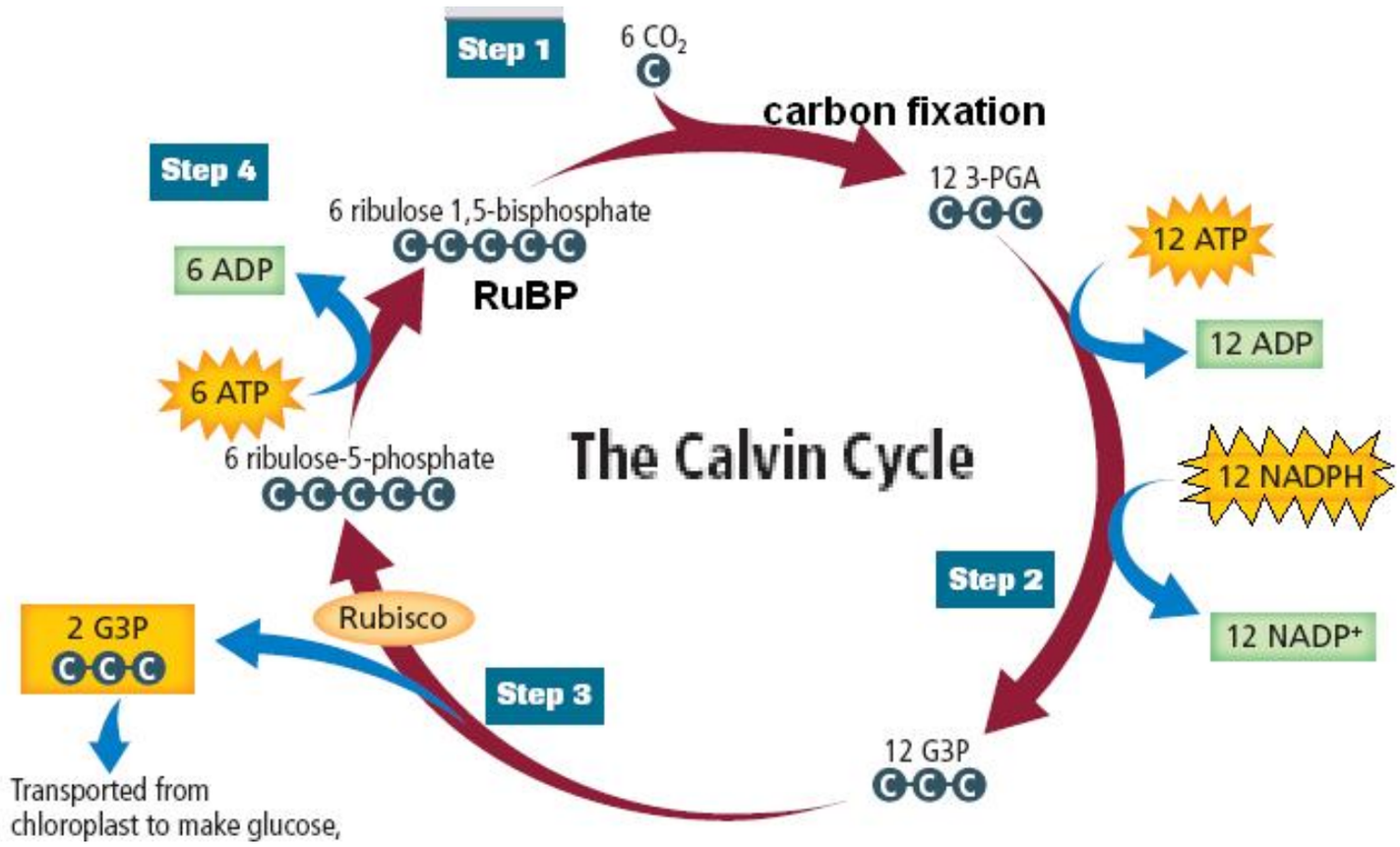
Main Point of Calvin Cycle

- 6 Ribulose bisphosphate (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…


Step 1
6 CO_2
carbon fixation
Step 4
12 3-PGA
6 ribulose 1,5-bisphosphate
RuBP
6 ADP
12 ATP
12 ADP
6 ATP
The Calvin Cycle
6 ribulose-5-phosphate
12 NADPH
Step 2
12 NADP+
Rubisco
2 G3P
Step 3
12 G3P
Transported from
chloroplast to make glucose,

Calvin Cycle

- for every 6 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



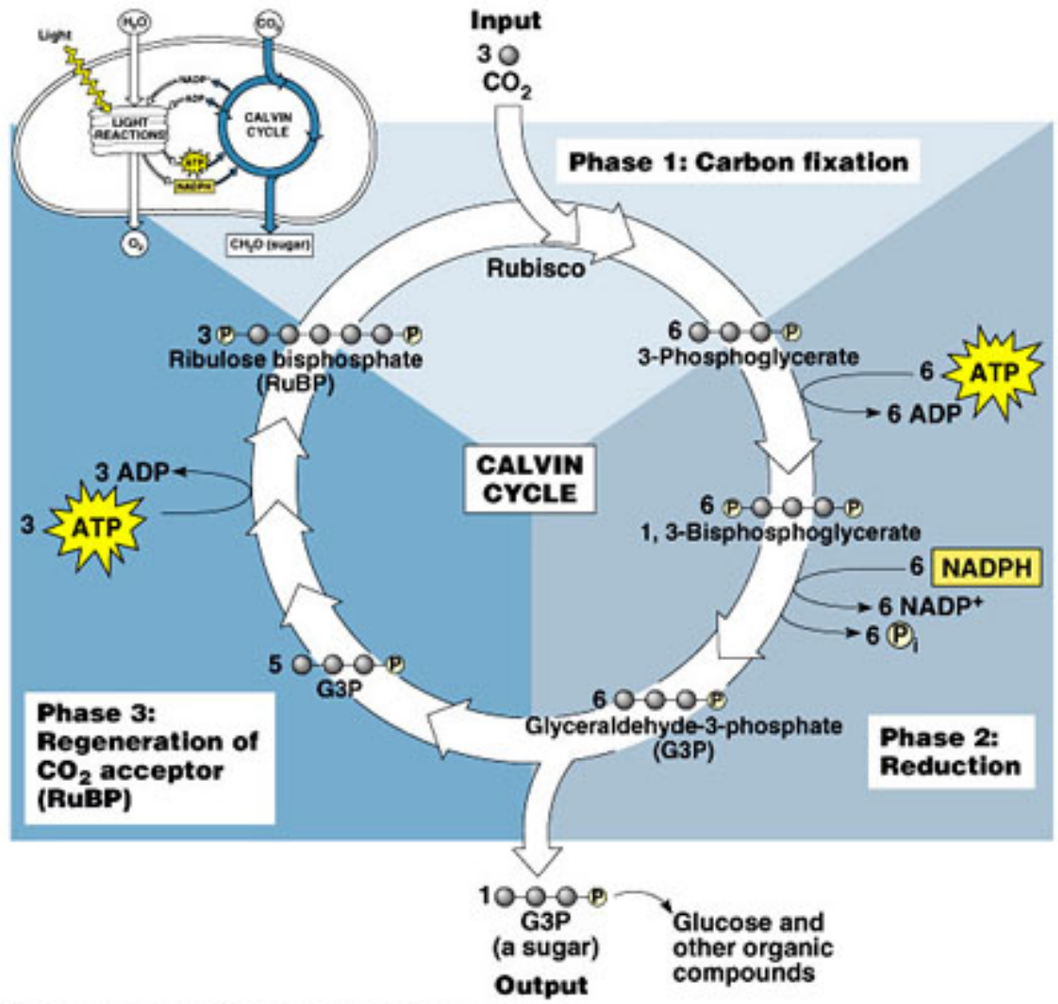
Animations

- Animation of Calvin cycle:

http://www.science.smith.edu/departments/Biology/Bio231/calvin.html

Energy Requirements

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

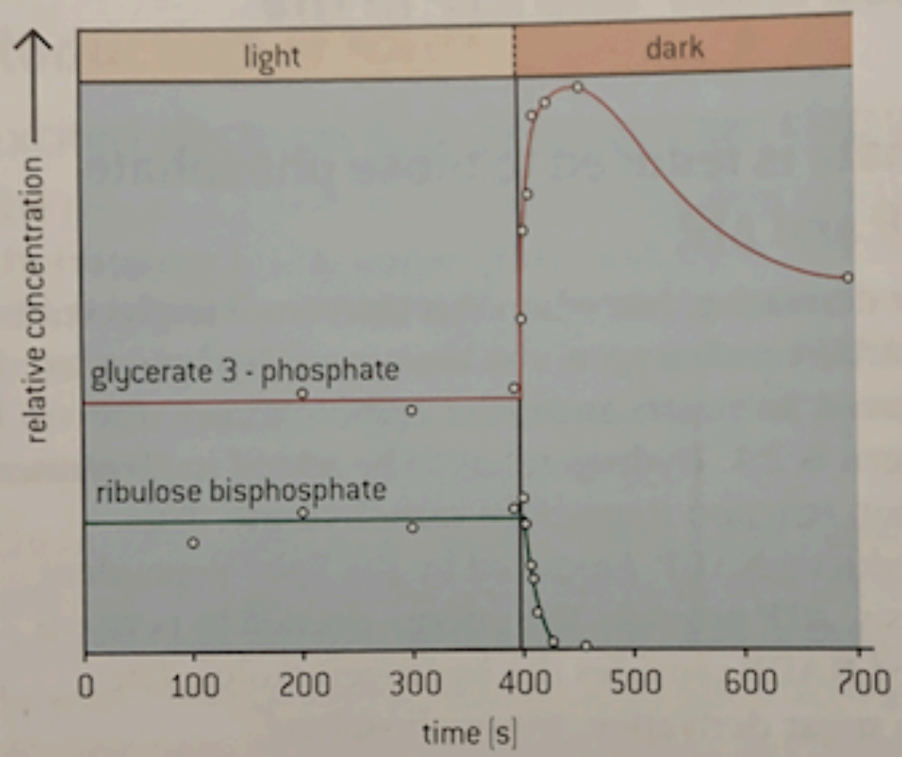


Follow-up

- In your Groups Work, on DATA BASED questions on 396/7
- You have 10 min.

Data-based questions: The effect of light and dark on carbon dioxide fixation

One of the pioneers of photosynthesis research was James Bassham. The results of one of his experiments are shown in figure 9. Concentrations of ribulose bisphosphate and glycerate 3-phosphate were monitored in a culture of cells of the alga, *Scenedesmus*. The algae were kept in bright light and then in the dark.



▲ Figure 9 Results of Bassham experiment

1 Compare the effects of the dark period on the concentrations of ribulose bisphosphate and glycerate 3-phosphate. [2]

2 Explain the change that took place in the 25 seconds after the start of darkness, to the concentration of:
   a) glycerate 3-phosphate [3]
   b) ribulose bisphosphate. [1]

3 Predict what the effect would be of turning the light back on after the period of darkness. [2]

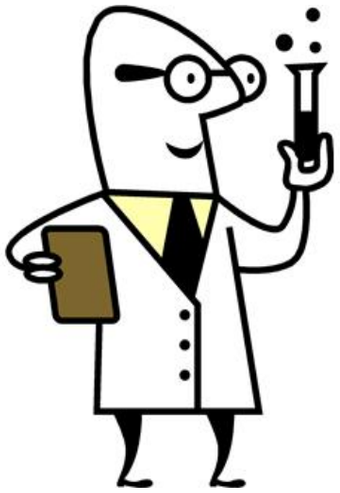
4 Predict the effect of reducing the carbon dioxide concentration from 1.0% to 0.003%, instead of changing from light to darkness:
   a) on glycerate 3-phosphate concentration [2]
   b) on ribulose bisphosphate concentration. [2]

Follow-up

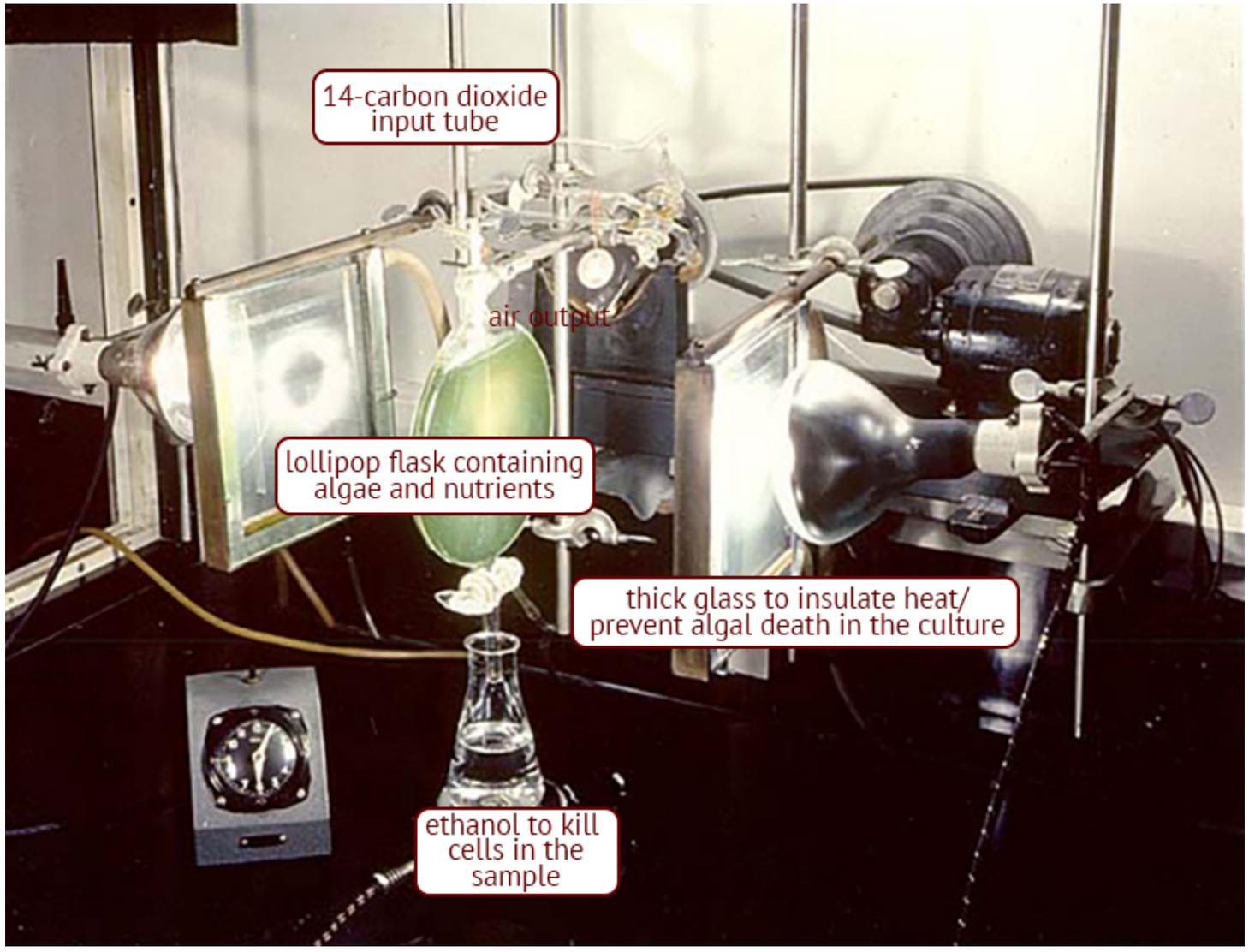
- In your Groups Work, on Question 2 on page 401.
- Draw a picture of the experiment, then try to answer the questions together.
- You have 5 min.

BREAK TIME

Take 15 minutes



ON YOUR OWN What the You Tube video on Calvin's experiment



- https://www.youtube.com/watch?v=V4DZvTfDXxU

Then follow up with the Question on Page 397


LIVE DEMO

- For the rest of the morning… Work on the Gizmo posted in Explore learning

- Run the research questions provided on the sheet in Edsby.

- WRITE a mini IA type **conclusion** and **evaluation** to submit for Monday.