PHOTOSYNTHESIS

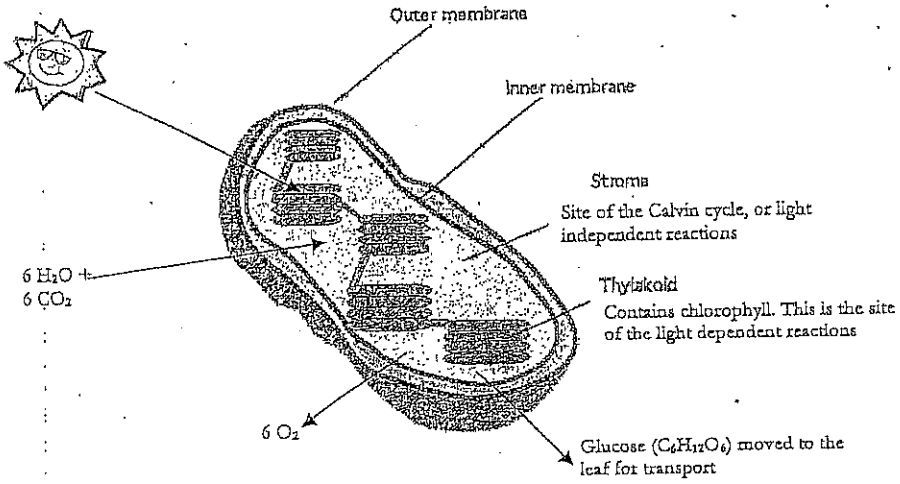
(How do the light dependent and light independent reactions provide food for a plant?)

Why?

How important are plants to life on Earth? Could life as we know it continue if there were no plants? Read on the find out why plants are truly the cornerstone of life.

Model 1:
An Overview of Photosynthesis and Chloroplast Structure

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



1. Which part of the chloroplast contains chlorophyll?

2. Where does the CO_2 go?

3. Where is the energy from the sunlight used?

4. Name this process that uses the energy from the sunlight.

5. Could this process take place in the dark? Use complete sentences to justify your answer.

6. Where does the Calvin cycle take place?

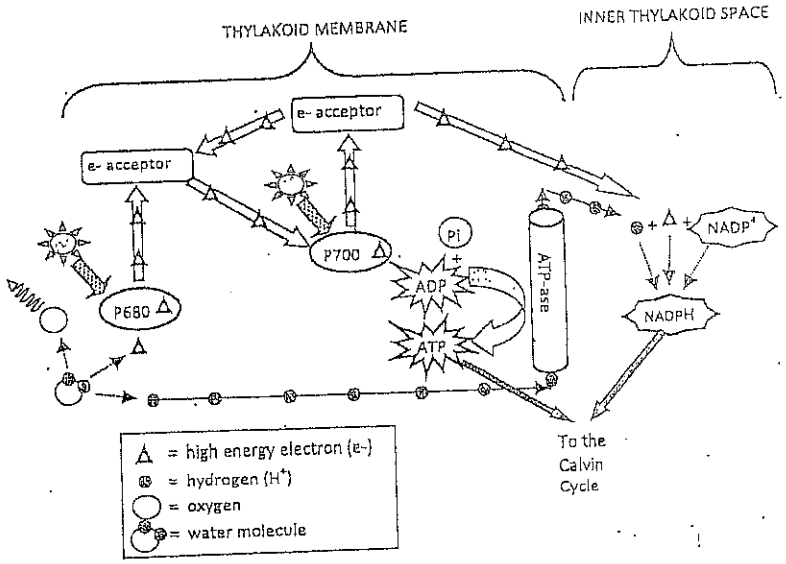
7. What is another name for the Calvin cycle?

8. Is light necessary for this cycle to occur? Use complete sentences to justify your answer.

9. What essential biological molecules does photosynthesis produce?

10. Why is it necessary to have six CO_2 entering the chloroplast?

Model 2:. The Light Dependent Reactions of Photosynthesis



11. Is CO_2 involved in the light dependent reactions?

12. What has happened to the water in the diagram, and what three things are produced?

13. What pigment absorbs the light energy and how is it represented in this model?

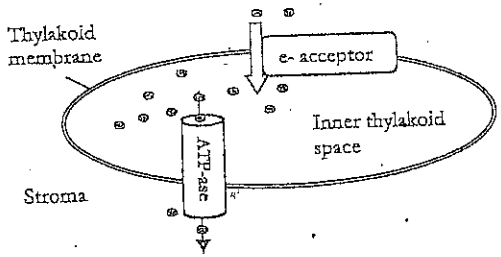
14. What is the source of the electrons (e) that enter P680?

15. What molecule ultimately takes up the electrons that leave P680 and P700?

16. Where do the ATP and NADPH go?

Model 3: Close-up of the Thylakoid Membrane

The electron transport chain is formed by a series of electron acceptor molecules in the thylakoid membrane. The movement of electrons through the transport chain provides energy to pump H^+ across the thylakoid membrane against the H^+ concentration gradient.



17. Why is energy needed to pump H^+ across the thylakoid membrane?

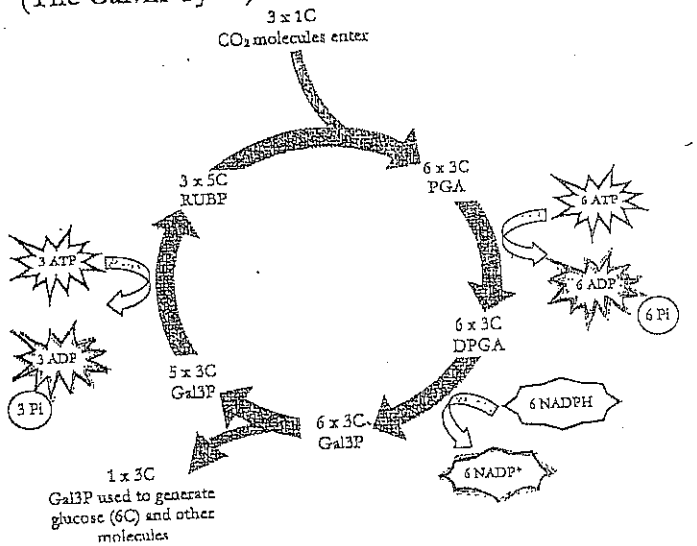
18. Why do the H^+ leak back into the stroma?

19. Through which molecule in the membrane does this leaking process occur and what type of biological molecule is this?

20. What molecule is produced as a result of the H^+ leaking back through the membrane?

STOP

Model 4: The Light Independent Reaction of Photosynthesis (The Calvin Cycle)



21. How many CO_2 molecules enter the Calvin cycle?

22. Explain in detail, using complete sentences, how the two reactions (light dependent and light independent) depend on each other.

23. How many turns of the Calvin Cycle are required to produce one molecule of glucose?

24. How many carbon atoms are needed to create a single molecule of glucose?

25. How many molecules of NADPH and ATP are needed to produce one molecule of glucose?

26. Under each molecule in the equation below, indicate whether it is used or produced and in which reaction (the Light Dependent or Calvin Cycle) that occurs.

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