

Question #82713, Biology, Other

Question:

List the steps of photosynthesis, from light reactions, to the Calvin cycle. What are the beginning and end products and how much of each? Where do each of the steps occur? (i.e. not just in the chloroplast, but where in the chloroplast?)

Answer:

Light reactions:

1. Carbon dioxide and water enter the plant leaves.
2. Light activates chlorophyll splitting H_2O into O_2 ($2H_2O \rightarrow O_2 + 2H^+ + 2e^-$, thylakoid membrane)
3. Released electrons go through electron transport chain interacting with $NADP^+$ producing $NADPH$ whereas H^+ leads to the formation of proton gradient leading to the production of ATP ($H_2O \rightarrow$ electron transport chain $\rightarrow ATP + 2NADPH$, thylakoid membrane).

Light independent reactions (Calvin cycle, all reaction occur in the chloroplast stroma):

1. Carbon fixation. $6 CO_2 + 6$ ribulose-1,5-bisphosphate + $12 ATP \rightarrow 12$ 3-phosphoglyceric acid + $12 ADP$
2. Reduction. 12 3-phosphoglyceric acid + $12 NADPH \rightarrow 12$ glyceraldehyde-3-phosphate + $12 NADP^+$
3. Regeneration. 10 glyceraldehyde-3-phosphate + $6 ATP \rightarrow 6$ ribulose phosphate + $6 ADP \rightarrow 6$ ribulose-1,5-bisphosphate
4. Glucose production. 2 glyceraldehyde-3-phosphate \rightarrow glucose