What is Photosynthesis?

Worksheet

Photosynthesis converts carbon dioxide and water into glucose and oxygen using light energy captured by chlorophyll, following the equation 6CO2 + 6H2O + light C6H12O6 + 6O2.

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

Questions

1. What are the reactants of photosynthesis?

A) Glucose and oxygen
B) Carbon dioxide and water
C) Water and oxygen
D) Glucose and carbon dioxide

2. Where does the Calvin cycle take place?

A) Thylakoid membrane
B) Mitochondria
C) Stroma
D) Nucleus

3. What gas is released as a byproduct of photosynthesis?

A) Carbon dioxide
B) Nitrogen
C) Oxygen
D) Hydrogen

4. What molecule stores the chemical energy produced by photosynthesis?

A) ATP only
B) Glucose
C) Chlorophyll
D) Water

5. A plant is given radioactively labeled CO2 (containing carbon-14). Where does the labeled carbon end up first?

6. A plant is placed in complete darkness for 24 hours. What happens to its rate of photosynthesis?

7. If a plant produces 6 molecules of O2, how many molecules of CO2 and H2O did it use, and how much glucose did it make (per the balanced equation)?

8. Define: What is the overall equation for photosynthesis?

9. Define: Where do the light-dependent reactions occur?

10. Define: Where does the Calvin cycle occur?

Answer Key

1. B) Carbon dioxide and water - CO_2 and H_2O, combined with light energy, are the inputs to photosynthesis.

2. C) Stroma - The Calvin cycle (light-independent reactions) occurs in the chloroplast's stroma.

3. C) Oxygen - Splitting water in the light reactions releases oxygen.

4. B) Glucose - Glucose ($C_6H_{12}O_6$) is the sugar that stores the captured energy.

5. CO_2 enters the Calvin cycle in the stroma of the chloroplast Carbon fixation attaches CO_2 to a 5-carbon molecule (RuBP) The labeled carbon appears first in G3P, and later in glucose

6. Light-dependent reactions require light to split water and generate ATP/NADPH Without light, no ATP or NADPH is produced The Calvin cycle stalls without these inputs, so photosynthesis rate drops to zero

7. The balanced equation is $6CO_2 + 6H_2O$ $C_6H_{12}O_6 + 6O_2$ 6 O_2 produced matches the equation's coefficient exactly So it used 6 CO_2 and 6 H_2O molecules and made 1 glucose molecule ($C_6H_{12}O_6$)

8. $6CO_2 + 6H_2O$ + light $C_6H_{12}O_6 + 6O_2$

9. In the thylakoid membranes of the chloroplast.

10. In the stroma of the chloroplast.