What is the Calvin Cycle?

Worksheet

The Calvin Cycle is a series of three phases-carbon fixation, reduction, and regeneration-that transforms CO and water into glucose using the ATP and NADPH produced in the light reactions.

3 CO_2 + 9 ATP + 6 NADPH @rightarrow G3P + 9 ADP + 6 NADP^+

Questions

1. How many times must the Calvin Cycle turn to make one glucose?

A) 3 times
B) 6 times
C) 9 times
D) 12 times

2. Which of these is NOT a phase of the Calvin Cycle?

A) Carbon fixation
B) Photolysis
C) Reduction
D) Regeneration

3. Why is it called 'light-independent'?

A) It does not use light at all
B) Light reactions produce ATP and NADPH it uses
C) It only happens at night
D) It produces no glucose

4. What does RuBisCO bind in carbon fixation?

A) ATP and CO
B) RuBP and CO
C) G3P and HO
D) NADPH and O

5. How many times must the Calvin Cycle turn over to produce one glucose molecule?

6. What is RuBisCO and its role?

7. Why does the Calvin Cycle need ATP and NADPH?

8. Define: What is the Calvin Cycle also called?

9. Define: List the three phases of the Calvin Cycle.

10. Define: What enzyme fixes CO in the Calvin Cycle?

Answer Key

1. B) 6 times - Glucose has 6 carbons. Each Calvin Cycle turn fixes 1 CO, so 6 turns fix 6 CO atoms, forming one glucose.

2. B) Photolysis - Photolysis occurs in the light reactions, not the Calvin Cycle. The three phases are fixation, reduction, and regeneration.

3. B) Light reactions produce ATP and NADPH it uses - The Calvin Cycle itself does not directly use photons, but it requires ATP and NADPH made by the light reactions.

4. B) RuBP and CO - RuBisCO catalyzes the attachment of CO to RuBP (ribulose bisphosphate), forming 3-phosphoglycerate.

5. Glucose has 6 carbons. Each cycle fixes 1 CO. Calvin Cycle must turn 6 times to fix 6 CO atoms. This produces 1 glucose (CHO).

6. RuBisCO = ribulose-1,5-bisphosphate carboxylase/oxygenase. It catalyzes carbon fixation by joining RuBP and CO. It is the most abundant protein on Earth.

7. ATP and NADPH are produced in the light reactions. They provide energy and reducing power (electrons) to reduce 3-PG to G3P. Without them, 3-PG cannot be converted to sugar.

8. The light-independent reactions, because it does not directly require light (though it needs ATP and NADPH from light reactions).

9. 1. Carbon fixation, 2. Reduction, 3. Regeneration.

10. RuBisCO (ribulose-1,5-bisphosphate carboxylase/oxygenase).