Active photosynthesis the calvin cycle key answer

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The Calvin Cycle: A Deeper Understanding**

What is the Calvin Cycle?

The Calvin cycle, also known as the reductive pentose phosphate pathway, is a series of chemical reactions that use the energy and reducing power generated in the light reactions of photosynthesis to convert carbon dioxide (CO2) into glucose, a sugar molecule.

Prerequisites for the Calvin Cycle:

- Carbon dioxide (CO2)
- Ribulose 1,5-bisphosphate (RuBP)
- ATP
- NADPH

Steps of the Calvin Cycle:

1. **Carbon Fixation:** CO2 combines with RuBP to form two molecules of 3-phosphoglycerate (3-PGA).
2. **ATP-Dependent Phosphorylation:** Each 3-PGA is phosphorylated using ATP to form 1,3-bisphosphoglycerate (1,3-BPG).
3. **NADPH-Dependent Reduction:** 1,3-BPG is reduced using NADPH to form glyceraldehyde 3-phosphate (G3P).
4. **Regeneration of RuBP:** Five of the six G3P molecules are used to regenerate the starting molecule RuBP. The sixth G3P is released as a product of the

cycle.

Role of ATP and NADPH in Photosynthesis:

- **ATP (Adenosine triphosphate):** Provides the energy for chemical reactions in the Calvin cycle.
- **NADPH (Nicotinamide adenine dinucleotide phosphate):** Provides the reducing power for the reduction of CO2 to glucose.

Energy Requirements for the Calvin Cycle:

- **ATP per G3P:** 3
- **NADPH per G3P:** 2

Calvin Cycle Production:

- **ATP produced per cycle:** None
- **G3P produced per cycle:** One

Key Points of the Calvin Cycle:

- Occurs in the stroma of chloroplasts
- Responsible for converting CO2 into glucose
- Consumes ATP and NADPH generated from the light reactions
- Drives the overall production of carbohydrates in plants

Overall Goal of the Calvin Cycle:

To fix atmospheric CO2 into organic molecules, such as glucose, which provide the energy and building blocks for plant growth.

Other Names for the Calvin Cycle:

- Light-Independent Reactions
- Reductive Pentose Phosphate Pathway

Energy Source for the Calvin Cycle:

ATP and NADPH generated during the light reactions of photosynthesis

Fate of CO2 in the Calvin Cycle:

- Fixed into 3-PGA
- Eventually converted into G3P, a sugar molecule

Short Definition of the Calvin Cycle:

A series of chemical reactions that convert CO2 into glucose using energy and reducing power from the light reactions.

Calvin Cycle in Chemistry:

A metabolic pathway that involves the reduction of CO2 to form glucose, a reaction essential for the production of carbohydrates in plants.

Calvin Cycle in A-Level Photosynthesis:

A key component of the photosynthesis process in plants, responsible for the reduction and assimilation of CO2 into organic molecules.

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