

Ap biology reading guide fred and theresa holtzclaw answer chapter 10

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What is the net production of one G3P requires? The net production of one G3P requires 9 molecules of ATP and 6 molecules of NADPH.

How do we know that the oxygen released in photosynthesis comes from water? The experiments showed that the O₂ from plants was labeled with ¹⁸O only if water was the source of the tracer. If the ¹⁸O was introduced to the plant in the form of CO₂, the label did not turn up in the released O₂. (nicotinamide adenine dinucleotide phosphate), where they are temporarily stored.

What important events occur in the carbon fixation stage of the Calvin cycle? Carbon fixation is the first step of the Calvin cycle. It involves the enzyme RuBisCO "fixing" CO₂ to RuBP, producing two molecules of 3-PGA. Three molecules of CO₂ are needed for the Calvin cycle to go through one full turn, producing six 3-PGA molecules. The second step is the reduction of 3-PGA to make G3P.

What carbohydrate is produced directly from the Calvin cycle? the carbohydrate produced directly from the Calvin cycle is actually not glucose, but a three carbon sugar called... CO₂ is attached to a 5 carbon sugar. Rubisco catalyzes this step. The product is a very unstable 6 carbon sugar that splits into 2 G3P.

How many ATP are produced per G3P? In the second stage glyceraldehyde 3-phosphate is converted in a series of steps to pyruvate/lactate, resulting in the generation of 2 molecules of ATP per molecule of glyceraldehyde-3-phosphate. Thus, a net of 2 molecules of ATP is generated in the conversion of glucose to pyruvate.

How many turns of the Calvin cycle does it take to net one G3P? Three turns of the Calvin cycle are needed to make one G3P molecule that can exit the cycle and go towards making glucose.

How does chemiosmosis produce ATP in photosynthesis? Chemiosmosis is the movement of ions across a semipermeable membrane bound structure, down their electrochemical gradient. An important example is the formation of adenosine triphosphate (ATP) by the movement of hydrogen ions (H^+) across a membrane during cellular respiration or photosynthesis.

Why is NADP⁺ needed in photosynthesis? NADP⁺ serves as an electron carrier during photosynthesis. During photosynthesis electrons are removed from water molecules by photosystem II, and these ultimately get transferred to NADP⁺ when it gets reduced to NADPH. The electrons are ultimately used to reduce organic molecules in the Calvin cycle to produce sugars.

Where is O₂ released in photosynthesis? The chloroplast is involved in both stages of photosynthesis. The light reactions take place in the thylakoid. There, water (H_2O) is oxidized, and oxygen (O_2) is released. The electrons that freed from the water are transferred to ATP and NADPH.

How is ATP produced during the light reaction? This is accomplished by the use of two different photosystems in the light reactions of photosynthesis, one to generate ATP and the other to generate NADPH. Electrons are transferred sequentially between the two photosystems, with photosystem I acting to generate NADPH and photosystem II acting to generate ATP.

What happens when rubisco fixes oxygen to RuBP? Photorespiration begins in the chloroplast, when rubisco attaches O_2 to RuBP in its oxygenase reaction. Two molecules are produced: a three-carbon compound, 3-PGA, and a two-carbon compound, phosphoglycolate.

How is CO₂ fixed in photosynthesis? The 3-hydroxypropionate cycle fixes CO₂ by combining it with an acetyl-CoA molecule, making malonyl-CoA, followed by reduction and elongation using a second molecule of CO₂.

What will happen if ATP and NADPH are already used up at night? ATP and NADPH are used in the light-dependent reactions of photosynthesis to produce glucose. If ATP and NADPH are already used up at night, the plant will not be able to produce glucose because these molecules are necessary for the process.

What is the initial source of electrons for the chloroplast electron transport chain? What is the initial source of electrons for the chloroplast electron transport chain? Water is the initial source. The reaction center contains a pair of chlorophyll a molecules with a special property.

What does cyclic electron flow in the chloroplast produce? The reactions involve two types of electron flow in the thylakoid membrane. While linear electron transport generates both ATP and NADPH, cyclic electron transport around photosystem I (PS I) is exclusively involved in ATP synthesis without the accumulation of NADPH.

What are the assumptions made during the calculation of net gain of ATP? The assumptions made during the calculation of net gain of ATP are: These metabolic pathways should occur in the sequential and orderly manner. NADH produced in glycolysis moves into the mitochondria for oxidative phosphorylation. Intermediates produced in the pathway are not utilized in other biochemical processes.

What are the explanatory notes of glycolysis? Glycolysis is the process in which glucose is broken down to produce energy. It produces two molecules of pyruvate, ATP, NADH and water. The process takes place in the cytoplasm of a cell and does not require oxygen. It occurs in both aerobic and anaerobic organisms.

What is the difference between the glycolysis and the TCA cycle? In glycolysis, carbon dioxide is not evolved whereas in TCA cycle carbon dioxide is evolved.

How many G3P leave the Calvin cycle? Because the G3P exported from the chloroplast has three carbon atoms, it takes three “turns” of the Calvin cycle to fix enough net carbon to export one G3P. But each turn makes two G3Ps, thus three turns make six G3Ps.

How much net gain of G3P is obtained after one Calvin cycle? Since each CO₂ molecule produces two G3P molecules, three CO₂ molecules produce six G3P

molecules, of which five are used to regenerate RuBP, leaving a net gain of one G3P molecule per three CO₂ molecules (as would be expected from the number of carbon atoms involved).

What is the main enzyme responsible for carbon fixation in the Calvin cycle?

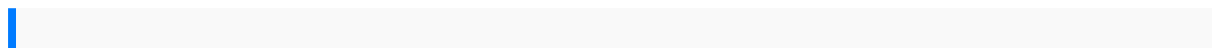
The enzyme that catalyzes this specific reaction is ribulose biphosphate carboxylase (RuBisCO). RuBisCO is identified as the most abundant enzyme on earth, to date. RuBisCO is the first enzyme utilized in the process of carbon fixation and its enzymatic activity is highly regulated.

How many CO₂ are needed to make 1 G3P? -To produce 1 molecule of G3P (which contains 3 carbons), the Calvin cycle must take up 3 molecules of CO₂ (1 carbon atom each).

What does it take to make one molecule of G3P? To produce one (1) molecule of glyceraldehyde 3-phosphate (G3P), three (3) molecules of ribulose biphosphate (RUBP) molecule combines with three (3) carbon dioxide molecules during the Calvin cycle. This process consumes nine (9) ATP and six (6) NADPH molecules generated from the light dependent reactions.

What is needed for a plant to produce G3P? ATP and NADPH are used to convert the six molecules of 3-PGA into six molecules of a chemical called glyceraldehyde 3-phosphate (G3P). That is a reduction reaction because it involves the gain of electrons by 3-PGA.

What is the net gain of G3P in one Calvin cycle? Since each CO₂ molecule produces two G3P molecules, three CO₂ molecules produce six G3P molecules, of which five are used to regenerate RuBP, leaving a net gain of one G3P molecule per three CO₂ molecules (as would be expected from the number of carbon atoms involved).



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