

Section 3: Photosynthesis in Detail

Study Guide A

KEY CONCEPT

Photosynthesis requires a series of chemical reactions.

VOCABULARY

photosystem

ATP synthase

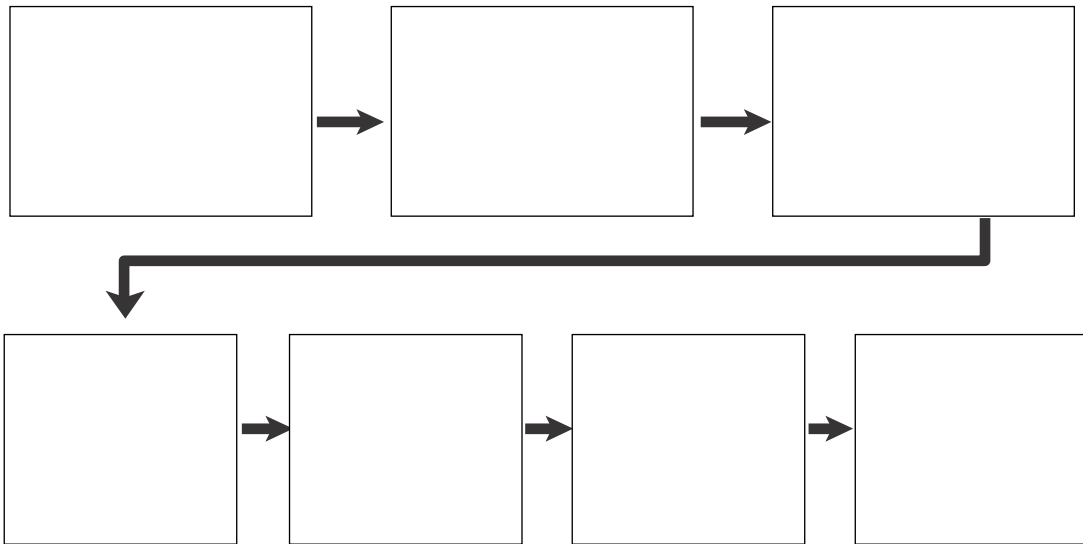
electron transport chain

Calvin cycle

MAIN IDEA: The first stage of photosynthesis captures and transfers energy.

1. The function of the light-dependent reactions is to _____ and _____ energy.
2. Photosystems are groups of _____ that capture and transfer energy.
3. The two molecules that carry energy to the light-independent reactions are _____ and _____.
4. Using the diagram on the next page, put each letter from the statements below into a box to show the seven steps of the light-dependent reactions.
 - a. ATP synthase produces ATP.
 - b. Chlorophyll (in the thylakoid membrane) absorbs energy from sunlight, and energized electrons enter the electron transport chain.
 - c. Energized electrons leave the electron transport chain and are used to produce NADPH.
 - d. Energy from electrons in the transport chain is used to pump hydrogen ions across the thylakoid membrane.
 - e. Hydrogen ions flow through a channel coupled to ATP synthase.
 - f. More energy is absorbed and transferred to electrons.
 - g. Water molecules are broken down. Oxygen is released as waste and electrons enter chlorophyll.

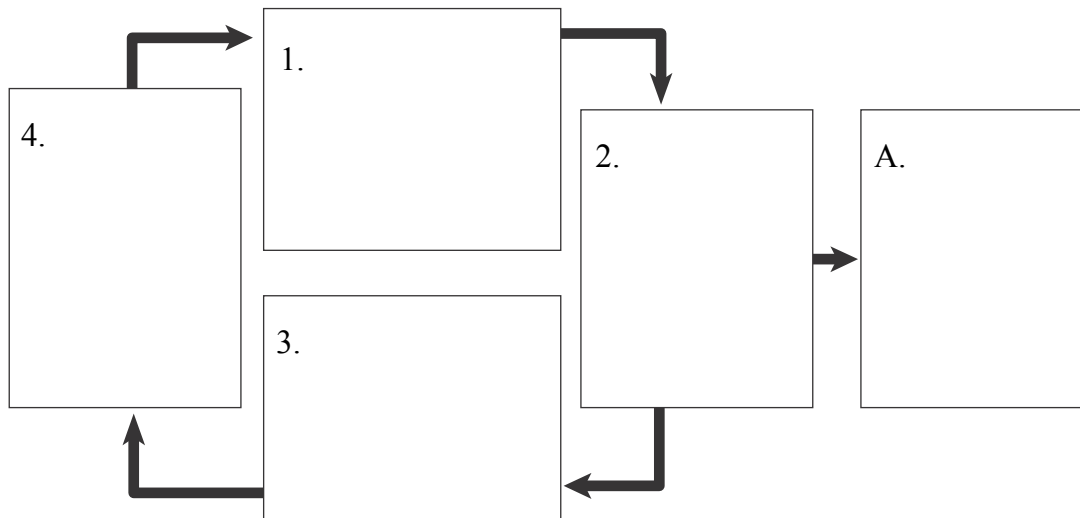
Study Guide A *continued*



MAIN IDEA: The second stage of photosynthesis uses energy from the first stage to make sugars.

5. The Calvin cycle uses energy from the light-dependent reactions to convert _____ into sugars.
6. Using the diagram on the next page, put the letter from each of the following statements into the appropriate box to show the four steps of the Calvin cycle.
 - a. A three-carbon molecule exits the cycle. Other three-carbon molecules stay in the cycle.
 - b. Carbon dioxide is added to the Calvin cycle.
 - c. Energy is used to convert the remaining three-carbon molecules into five-carbon molecules.
 - d. Energy is used to split six-carbon molecules. Three-carbon molecules are formed and rearranged.
 - e. When two three-carbon molecules have left the cycle they bond to form a six-carbon sugar (glucose).

Study Guide A *continued*



Vocabulary Check

Circle the word or phrase that best completes the statement.

7. The electron transport chain is a series of *proteins / carbohydrates* in the thylakoid membrane along which energized electrons travel.
8. The first part of an enzyme's name tells you about its function. All enzymes end with the suffix *-ase*. Therefore, ATP synthase is an enzyme that *synthesizes / synchronizes* ATP.
9. The word cycle tells you that the chemical reactions of the Calvin cycle go from one to another *with a beginning and an end / with no beginning or end*.