

## Section 3: Photosynthesis in Detail

# Study Guide A

**KEY CONCEPT**

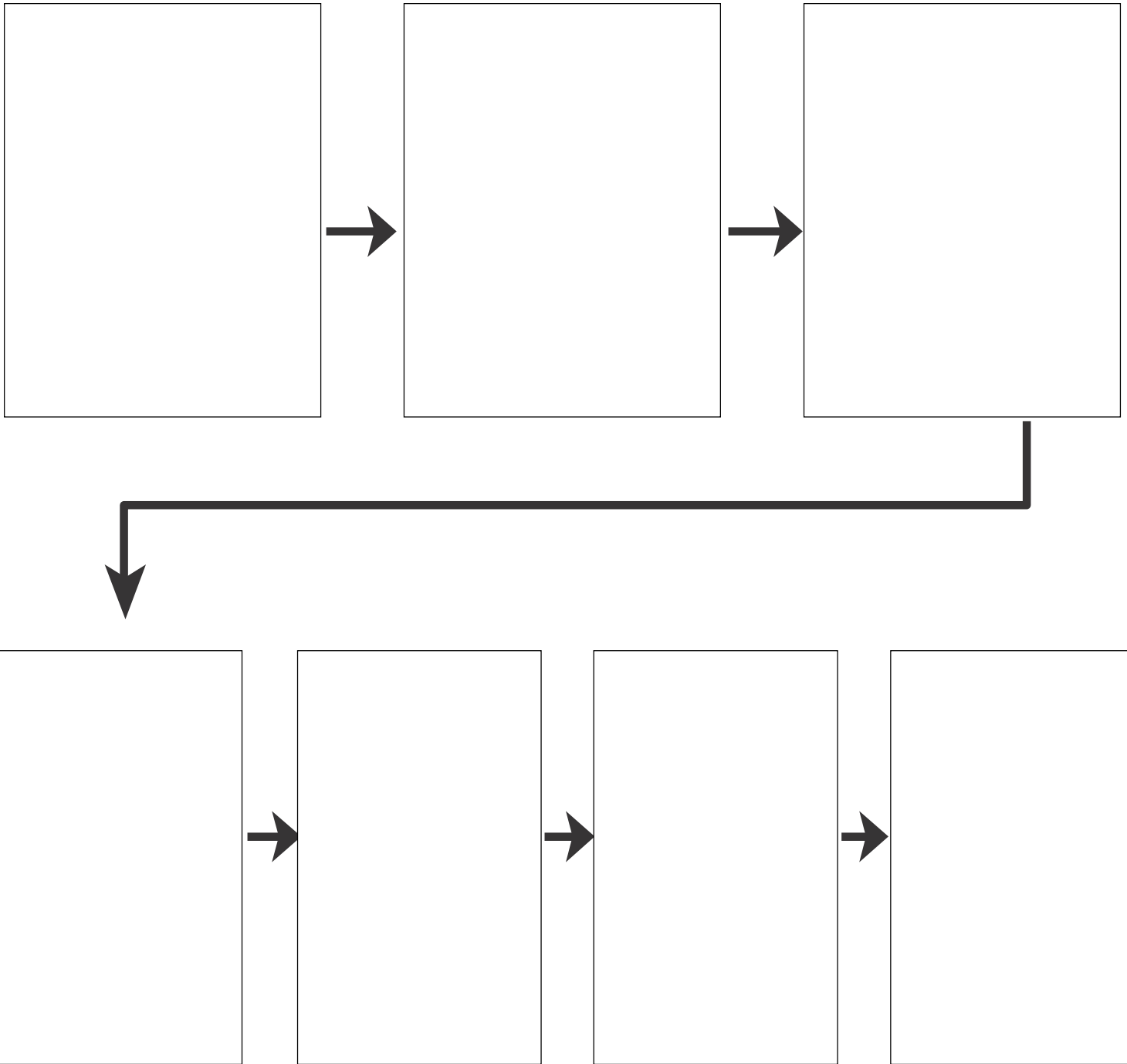
Photosynthesis requires a series of chemical reactions.

**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, choose from the lettered statements below and write it in 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.

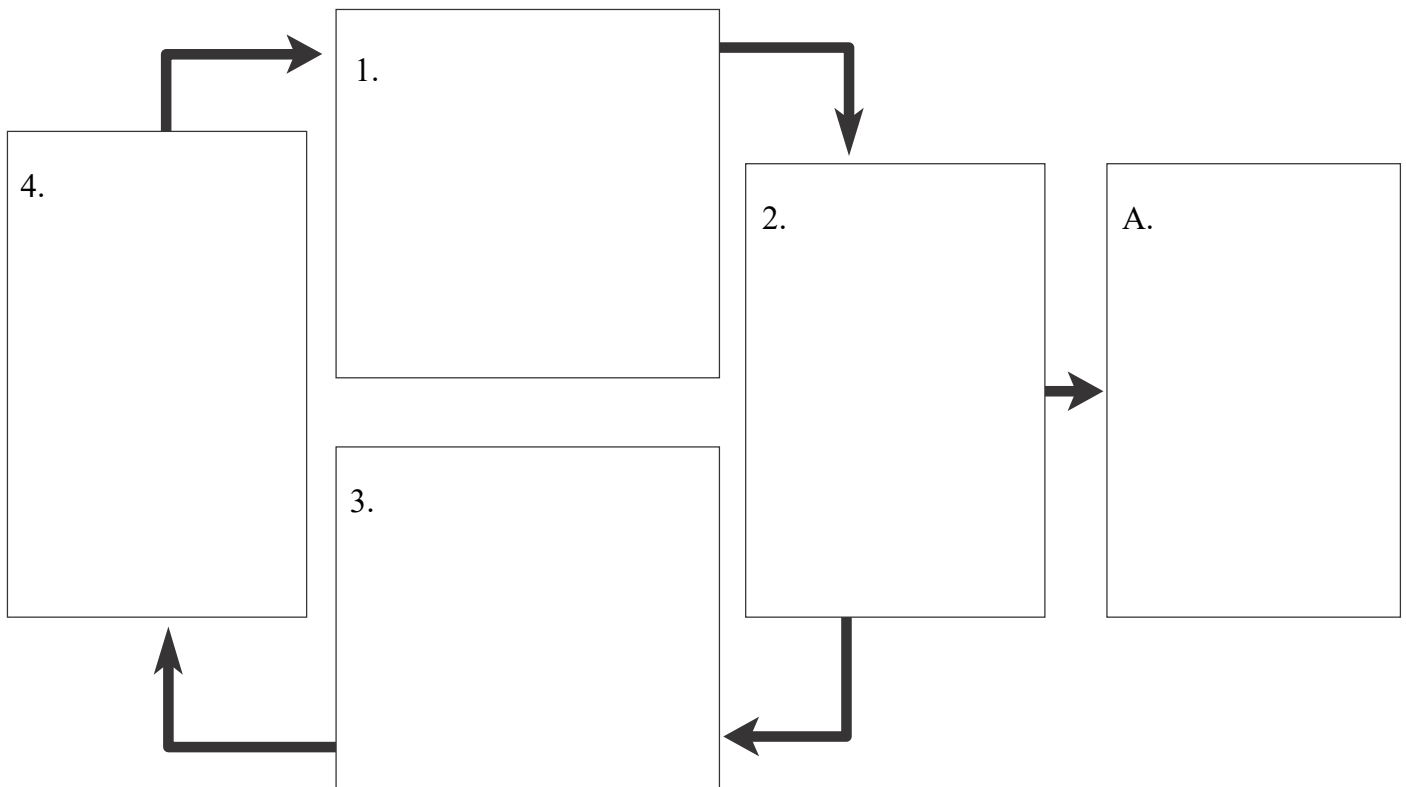


**MAIN IDEA:** The second stage of photosynthesis uses energy from the first stage to make sugars.

5. The Calvin cycle uses energy from the light-dependent reactions to convert \_\_\_\_\_ into sugars.

**6. Using the diagram, choose from the lettered statements below and write it in 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).



**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*.