




## 8.3 The Process of Photosynthesis

### Lesson Objectives

-  Describe what happens during the light-dependent reactions.
-  Explain what happens during the light-independent reactions.
-  Identify factors that affect the rate at which photosynthesis occurs.

### BUILD Vocabulary

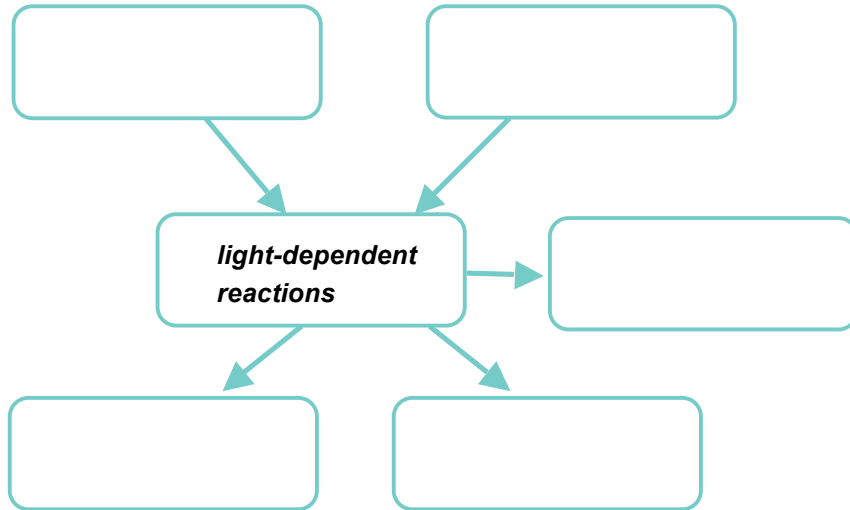
A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

| Term                     | Definition  | How I'm Going to Remember the Meaning  |
|--------------------------|---|--|
| ATP synthase             | Enzyme that converts ADP and a phosphate group to ATP   | <i>Many enzymes end in the suffix –ase, and ATP synthase is an enzyme that produces ATP.</i> |
| Calvin cycle             | Another name for the light-independent reactions in which carbohydrates are produced                      |  |
| Electron transport chain | Series of electron-carrier proteins that transport high-energy electrons during the process of making ATP |  |
| Photosystem              | Cluster of chlorophyll and proteins in the thylakoids essential to the light-dependent reactions          |  |

B. As you work through this lesson, you may find these terms in the activities. When you write a key term or a definition, **highlight** the term or the definition.

## BUILD Understanding

**Flowchart** A flowchart is a way to show the steps in a process. As you read, complete the flowchart to show the steps involved in the light-dependent reactions of photosynthesis.



## Light-Dependent and Light-Independent Reactions

Photosynthesis involves two sets of reactions. The light-dependent reactions need sunlight. They use energy from this sunlight to produce energy-rich compounds, like ATP. The light-independent reactions use these energy-rich compounds to produce sugars from carbon dioxide.

Complete the T-chart. Write the phrases in the box that belong in each side of the chart.

|  |   |
|--|---|
| <ul style="list-style-type: none"> <li><b>Use energy from the sun</b></li> <li><b>Use carbon dioxide</b></li> <li><b>Produce oxygen</b></li> <li><b>Produce sugars</b></li> <li><b>Convert ADP into ATP</b></li> </ul> | <ul style="list-style-type: none"> <li><b>Take place in the stroma</b></li> <li><b>Take place in thylakoids</b></li> <li><b>Require water</b></li> <li><b>Also called Calvin cycle</b></li> </ul> |
|--|---|

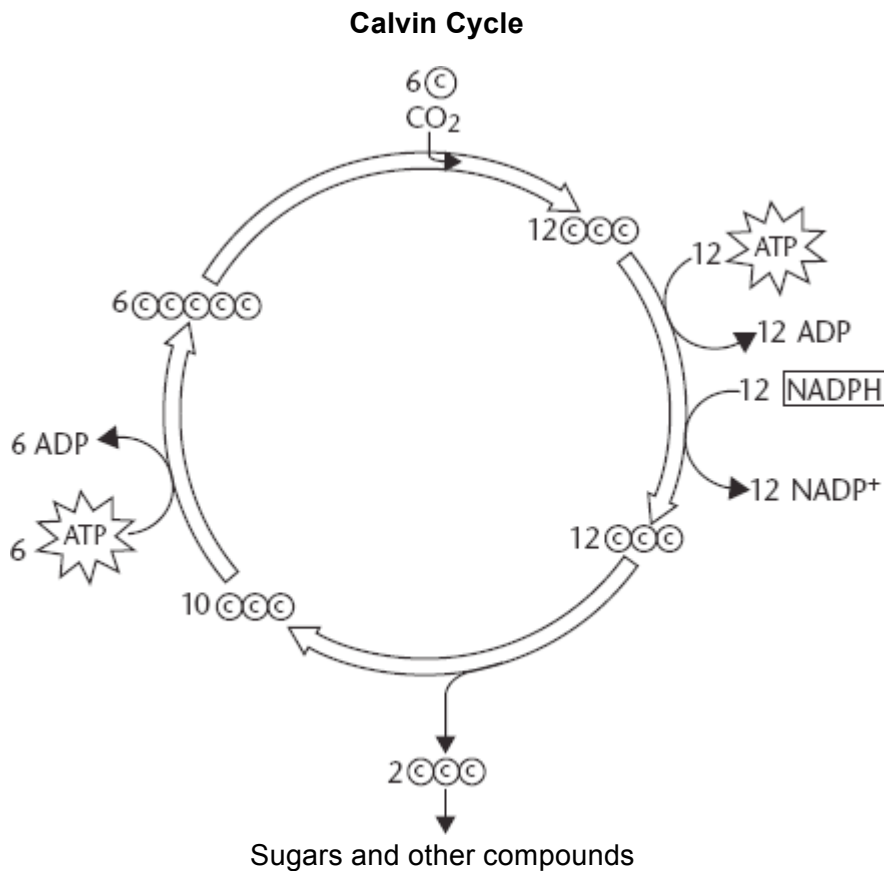
| <b>Light-dependent Reactions</b> | <b>Light-independent Reactions</b> |
|----------------------------------|------------------------------------|
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## The Light-Independent Reactions: Producing Sugars

Both ATP and NADPH are produced by the light-dependent reactions of photosynthesis. The Calvin cycle uses the energy in ATP and NADPH to produce high-energy sugars. A model of the Calvin cycle is shown below.

*Follow the directions.*

1. Circle the places where ATP and NADPH are used.
2. Draw an X over the two 3-carbon molecules that are removed from the cycle to produce sugars, lipids, and other compounds.



*Answer the questions.*

3. Circle the letter of each statement that is true about the Calvin cycle.
  - A. The main products of the Calvin cycle are six carbon dioxide molecules.
  - B. Carbon dioxide molecules enter the Calvin cycle from the atmosphere.
  - C. Energy from ATP and high-energy electrons from NADPH are used to convert 3-carbon molecules into higher-energy forms.
  - D. The Calvin cycle uses 6 molecules of carbon dioxide to produce a single 6-carbon sugar molecule.
4. Why are the reactions of the Calvin cycle also called the light-independent reactions?