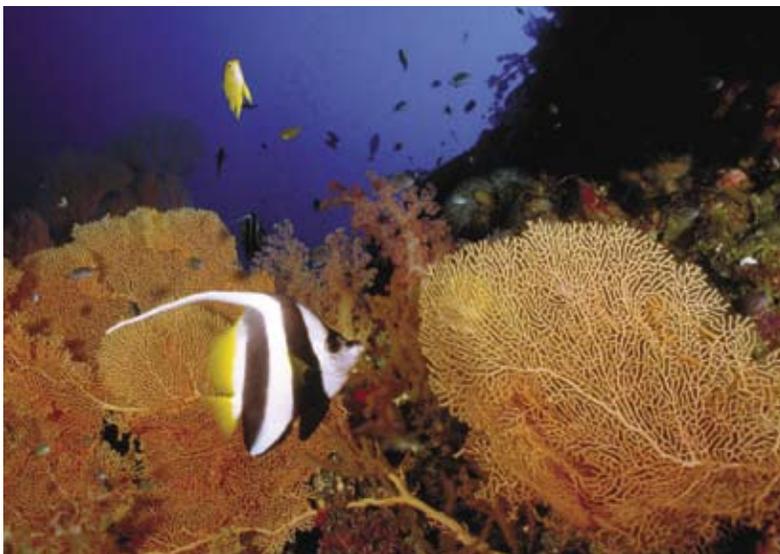


# 9

## The Photosynthesis and Cellular Respiration Shuffle

**I**N THE PREVIOUS activity, “Moving Through the Carbon Cycle,” you examined how carbon travels between reservoirs on earth. In this activity you will look more closely at how carbon and oxygen are continuously cycled by organisms and how these elements sustain both the organisms and ecosystems. You will examine what happens to carbon and oxygen at the cellular level.

Two fundamental cellular processes are cellular respiration and photosynthesis. **Cellular respiration** is the process by which cells release stored energy from sugars. **Photosynthesis** is the process in which producer cells use carbon dioxide, water, and nutrients to produce glucose and oxygen. Together these two processes make the carbon cycle possible, and move essential molecules through ecosystems.



*All organisms in this community perform cellular respiration and some photosynthesize.*

### Challenge

► How do carbon and oxygen cycle through the environment?

#### MATERIALS

**FOR EACH GROUP OF FOUR STUDENTS**

set of 12 Photosynthesis and Cellular Respiration Shuffle paper strips

**FOR EACH PAIR OF STUDENTS**

computer with Internet access

**FOR EACH STUDENT**

Student Sheet 9.1, “Photosynthesis and Cellular Respiration Diagram”

## Procedure

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1. Complete Student Sheet 9.1, “Photosynthesis and Cellular Respiration Diagram,” as directed by your teacher.
2. Find the “Photosynthesis and Cellular Respiration Shuffle” animation on the *Science and Global Issues* page of the SEPUP website at [sepuplhs.org/sgi](http://sepuplhs.org/sgi). Sort the images based on what you already know about photosynthesis and cellular respiration, and on what you can see in the images.
3. When you have completed the animation, follow your teacher’s instructions to record the results in your science notebook.
4. Obtain the Photosynthesis and Cellular Respiration Shuffle paper strips from your teacher.
5. With your group, lay all of the strips out on the table, and read each one aloud.
6. Sort the strips into two piles, one for cellular respiration and one for photosynthesis. If you are unsure about where any of the strips belong, lay them out next to where you will be working so that you can see them as you work.
7. Choose a stack to start with. Put the strips in the order in which you think the processes are happening.
8. Repeat Step 7 for the stack you have not ordered yet.
9. If you had any strips that you did not place, try to decide where they belong now that you have ordered the other strips.
10. Once you have all of the strips in order, compare your strips to the results from the animation, and make any adjustments in the order of the strips that you need to.

**Note:** There are more strips than animation images, and so more than one strip may fit with a single image.

11. Based on what you see in the animation and on the strips, write in your science notebook a short paragraph describing cellular respiration and one describing photosynthesis. Be sure you write in your own words, and do not just copy the strips.

## Analysis

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1. What does a producer need for performing photosynthesis, and what does photosynthesis produce?
2. What does an organism need to perform cellular respiration, and what does cellular respiration produce?
3. What roles do photosynthesis and cellular respiration have in an ecosystem?
4. Go back to your diagram on Student Sheet 9.1, “Photosynthesis and Cellular Respiration Diagram,” and revise it, or sketch a new one based on what you have learned in this activity. Be sure to show where enzymes are involved, as well as carbon dioxide, water, oxygen, and glucose.
5. If someone says, “Only organisms that breathe can perform cellular respiration,” are they correct? Explain.
6. If the mitochondria of half the organisms in the ecosystem stopped functioning, what indicators in the ecosystem would change? Explain.
7. There are specialized producers that live in warm-water vents deep in the ocean. These producers do not perform photosynthesis, but instead perform a similar process with iron and other chemicals. Why do you think these producers use this process instead of photosynthesis?

### KEY VOCABULARY

|                             |                       |
|-----------------------------|-----------------------|
| <b>cellular respiration</b> | organisms             |
| enzymes                     | <b>photosynthesis</b> |