

CHAPTER 2 Cycles in Nature

SECTION 1 **The Cycles of Matter**

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- Why does matter need to be recycled?
- How are water, carbon, and nitrogen recycled?

National Science Education Standards
 LS 1c, 4b, 4c, 5a

Why Is Matter Recycled on Earth?

The matter in your body has been on Earth since the planet formed billions of years ago. Matter on Earth is limited, so it must be used over and over again. Each kind of matter has its own cycles. In these cycles, matter moves between the environment and living things.

STUDY TIP

Mnemonic As you read, create a mnemonic device, or memory trick, to help you remember the parts of the water cycle.

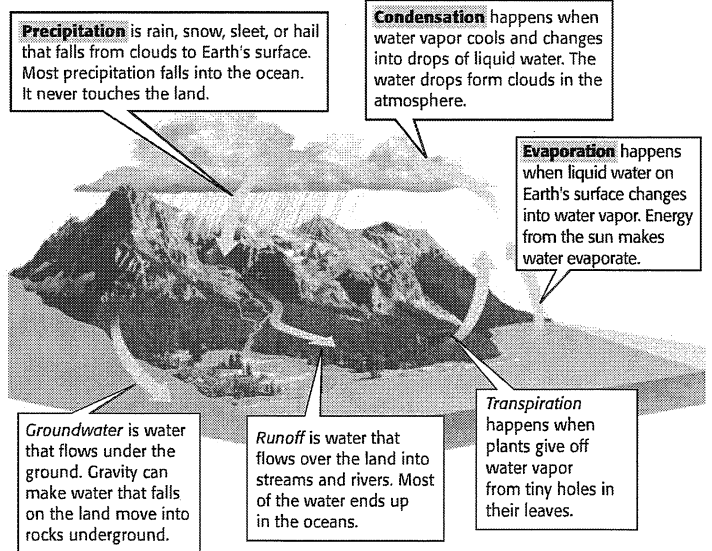
What Is the Water Cycle?

Without water there would be no life on Earth. All living things are made mostly of water. Water carries other nutrients to cells and carries wastes away from them. It also helps living things regulate their temperatures. Like all matter, water is limited on Earth. The water cycle lets living things use water over and over.

In the environment, water moves between the oceans, atmosphere, land, and living things. Eventually, all the water taken in by organisms returns to the environment. The movement of water is known as the *water cycle*. The parts of the water cycle are explained in the figure below.

Say It

Identify Describe to the class all the things you and your family do in a day that use water. Can you think of any ways you might be able to use less water?



TAKE A LOOK

1. Describe How do clouds form?

H₂O vapor cools,
changes into
drops; drops form
clouds

SECTION 1 The Cycles of Matter *continued*

STANDARDS CHECK

LS 4c For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy passes from organism to organism in food webs.

2. Analyze Explain the role of photosynthesis in the carbon cycle.

P.S uses CO₂
from air -
When org. mols.
(sugar) are
broken down,
the C returns
to the
environment

What Is the Carbon Cycle?

Besides water, the most common molecules in living things are *organic molecules*. These are molecules that contain carbon, such as sugar. Carbon moves between the environment and living things in the *carbon cycle*.

PHOTOSYNTHESIS AND RESPIRATION

Plants are producers. This means they make their own food. They use water, carbon dioxide, and sunlight to make sugar. This process is called *photosynthesis*. Photosynthesis is the basis of the carbon cycle.

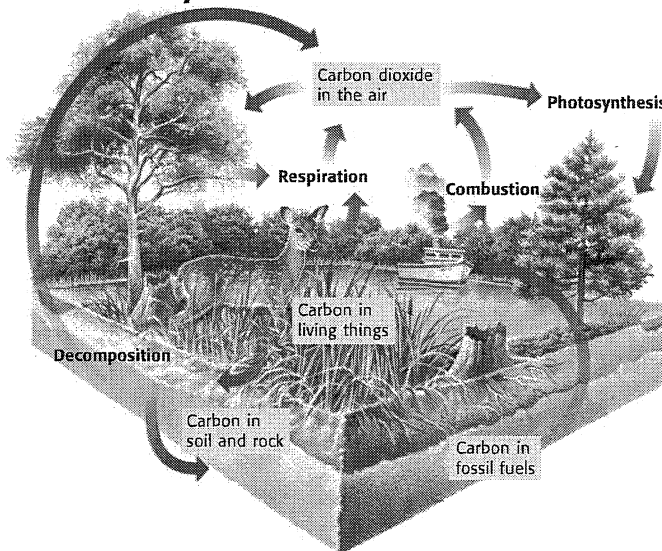
Animals are consumers. This means they have to consume other organisms to get energy. Most animals get the carbon and energy they need by eating plants. How does this carbon return to the environment? It returns when cells break down sugar molecules to release energy. This process is called *respiration*.

DECOMPOSITION AND COMBUSTION

Fungi and some bacteria get their energy by breaking down wastes and dead organisms. This process is called **decomposition**. When organisms decompose organic matter, they return carbon dioxide and water to the environment.

When organic molecules, such as those in wood or fossil fuels, are burned, it is called **combustion**. Combustion releases the carbon stored in these organic molecules back into the atmosphere.

The Carbon Cycle



TAKE A LOOK

3. Complete Carbon dioxide in the air is used for photosynthesis

4. List What three processes release carbon dioxide into the environment?
respiration
combustion
decomposition

SECTION 1 The Cycles of Matter *continued*

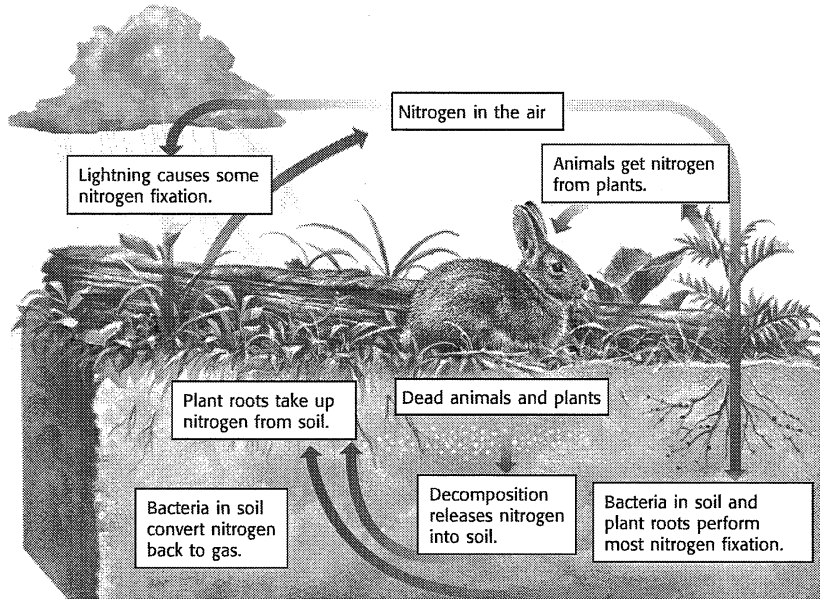
What Is the Nitrogen Cycle?

Nitrogen is also important to living things. Organisms need nitrogen to build proteins and DNA for new cells. Like water and carbon, nitrogen cycles through living things and the environment. This is called the *nitrogen cycle*.

NITROGEN FIXATION

About 78% of Earth's atmosphere is nitrogen gas. Most organisms cannot use nitrogen gas directly. Bacteria in soil can change nitrogen gas into forms that plants can use. This is called *nitrogen fixation*. Other organisms can get the nitrogen they need by eating plants or by eating organisms that eat plants.

The Nitrogen Cycle



How Are the Cycles of Matter Connected?

Other forms of matter on Earth also cycle through the environment. These include many minerals that living cells need, such as calcium and phosphorus. When an organism dies, every substance in its body will be recycled in the environment or reused by other organisms. ✓

All of the cycles of matter are connected. For example, water carries some forms of carbon and nitrogen through the environment. Many nutrients pass from soil to plants to animals and back. Living things play a part in each of the cycles.

Critical Thinking

5. Apply Concepts How is nitrogen fixation important to animals?

Plants "fix" nitrogen - Animals need N + can only get it from molecules plants have put it in (N)

TAKE A LOOK

6. Identify What process releases nitrogen into the soil?

decomposition

READING CHECK

7. Explain What happens to the substances in an organism's body when the organism dies?

They are recycled by decomposers - released into environment - taken in by other organisms

Section 1 Review

NSES LS 1c, 4b, 4c, 5a

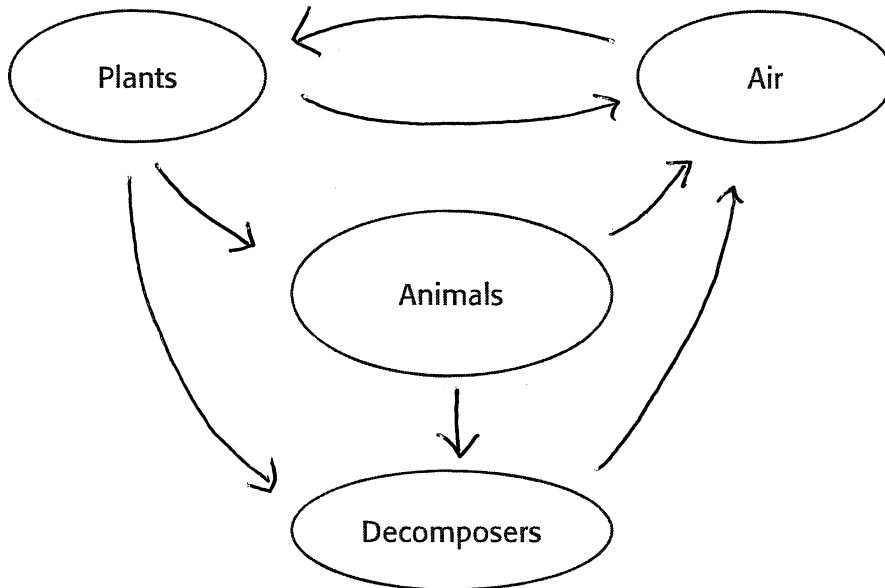
SECTION VOCABULARY

<p>combustion the burning of a substance</p> <p>condensation the change of state from a gas to a liquid</p> <p>decomposition the breakdown of substances into simpler molecular substances</p>	<p>evaporation the change of state from a liquid to a gas</p> <p>precipitation any form of water that falls to Earth's surface from the clouds</p>
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1. **Identify** In the water cycle, what makes water evaporate?

_____ Energy from sun _____

2. **Summarize** Draw arrows to show how carbon cycles through the environment and living things.



3. **Explain** Why does matter need to be recycled?

_____ Matter is limited (on Earth) _____

4. **Explain** Why is water so important to life on Earth?

- o H_2O carries nutrients & waste to & from cells
- o H_2O ~~the~~ helps regulate temp.
- o Cells are mostly H_2O

5. **Define** What is nitrogen fixation?

_____ process by which bacteria ^{PUT} change N (in gas) _____
 _____ into ~~nitrogen~~ molecules (molecules organisms _____
 _____ can use)

6. **Define** What are organic molecules?

_____ Molecules that contain Carbon (+ made by _____
 _____ living thing)