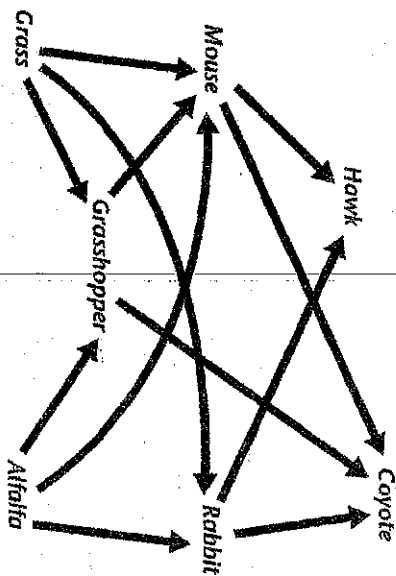


Ecosystems and Biomes • Review and Reinforce

# Energy Flow in Ecosystems

## Understanding Main Ideas

Answer the following questions on a separate sheet of paper.



1. Which organism in the food web above is sometimes a first-level consumer and sometimes a second-level consumer? Explain.
2. Choose one food chain in the web. Name all the organisms in that chain. Start with the producer and end with the top-level consumer.
3. Draw an energy pyramid for the food chain you chose. Label the pyramid to tell how much food energy is available at each level.

## Building Vocabulary

On a separate sheet of paper, write the term that fits each definition below.

4. Organisms that make their own food
5. Organisms that obtain energy by feeding on other organisms
6. Organisms that break down wastes and dead organisms and return the raw materials to the environment
7. Consumers that eat only animals
8. Consumers that eat only plants
9. Consumers that eat both plants and animals
10. Consumers that feed on the bodies of dead organisms

# Cycles of Matter

## Guide for Reading

- What three major processes make up the water cycle?
- How are carbon and oxygen recycled in ecosystems?
- What is the nitrogen cycle?

Matter is recycled in ecosystems. Matter includes water, oxygen, carbon, nitrogen, and many other substances. Three of the most important cycles of matter are the water cycle, the carbon-oxygen cycle, and the nitrogen cycle.

The water cycle is the continuous process by which water moves from Earth's surface to the atmosphere and back. The processes of **evaporation, condensation, and precipitation** make up the water cycle. Evaporation is the process by which molecules of liquid water absorb energy and change to the gas state. Water evaporates from Earth's surface and forms water vapor, a gas, in the atmosphere. The process by which a gas changes to a liquid is called **condensation**. When water vapor in the atmosphere cools, it turns back into tiny droplets of liquid water. As more water vapor condenses, the drops grow larger and heavier. Eventually, the heavy drops fall back to Earth as a form of **precipitation**—rain, snow, sleet, or hail.

Carbon is the building block for the matter that makes up the bodies of living things. In the ecosystem, the processes by which carbon and oxygen are recycled are linked. Producers, consumers, and decomposers play roles in recycling carbon and oxygen. Producers take in carbon dioxide from the atmosphere during photosynthesis. In this process, the producers use carbon from the carbon dioxide to produce other carbon-containing molecules. These molecules include sugars and starches. Consumers obtain energy from these molecules by breaking them down into simpler molecules. The consumers release water and carbon dioxide as waste products of the process. At the same time, producers release oxygen during photosynthesis. Other organisms take in oxygen from the atmosphere and use it in their life processes.

Like carbon, nitrogen is a necessary building block in the matter that makes up living things. In the nitrogen cycle, nitrogen moves from the air to the soil, into living things, and back into the air. Most organisms cannot use nitrogen gas in the air. Nitrogen gas is called "free" nitrogen because it is not combined with other kinds of atoms. Most organisms can use nitrogen only when it has been "fixed," or combined with other elements to form nitrogen-containing compounds. The process of changing nitrogen gas into a usable form of nitrogen is called **nitrogen fixation**. Most nitrogen fixation is performed by certain kinds of bacteria. Some of these bacteria live in bumps called nodules on the roots of certain plants. Once the nitrogen has been fixed, it can be used by organisms to build proteins and other complex substances. Decomposers break down these complex compounds. Decomposition returns simple nitrogen compounds to the soil. Certain types of bacteria break down the nitrogen compounds completely. These bacteria release free nitrogen back into the air, and the cycle starts again.

**Ecosystems and Biomes • Guided Reading and Study**

**Cycles of Matter**

*This section describes three cycles in nature that recycle matter in ecosystems.*

**Introduction**

- Matter is made up of tiny particles called \_\_\_\_\_  
Combinations of two or more of these tiny particles are called \_\_\_\_\_
- Circle the letter of each sentence that is true about matter and energy in ecosystems.
  - The supply of matter in an ecosystem is limited.
  - Matter is recycled in an ecosystem.
  - Energy is recycled in an ecosystem.

**The Water Cycle**

- Is the following sentence true or false? Water is essential for life. \_\_\_\_\_
- The continuous process by which water moves from Earth's surface to the atmosphere and back is the \_\_\_\_\_.

Match the term with its definition.

Term	Definition
5. evaporation	a. Process by which liquid water changes to water vapor
6. condensation	b. Forms of water that fall from clouds and reach Earth's surface
7. precipitation	c. Process by which water vapor changes to liquid water

- Is the following sentence true or false? The energy for evaporation comes from the sun. \_\_\_\_\_
- What process results in the formation of clouds? \_\_\_\_\_

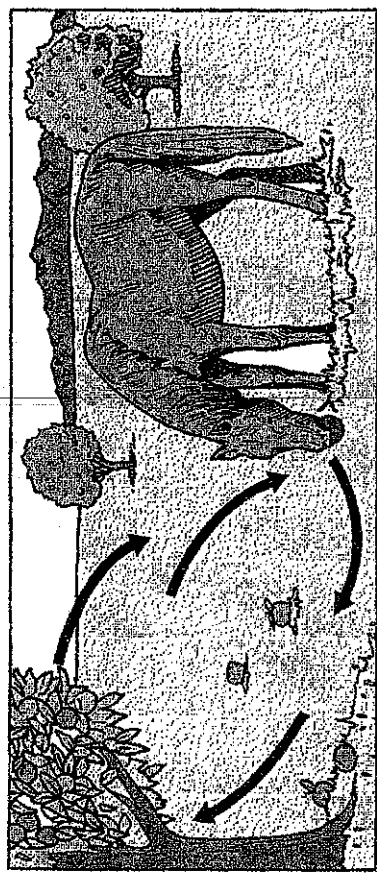
10. List four forms of precipitation.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Cycles of Matter (continued)**

**The Carbon and Oxygen Cycles**

- Is the following sentence true or false? Carbon is not necessary for life. \_\_\_\_\_
- Circle the letter of each sentence that is true about the carbon and oxygen cycles.
  - Producers take in oxygen during photosynthesis.
  - Producers release carbon dioxide as a result of photosynthesis.
  - Consumers release carbon dioxide as a waste product.
  - Consumers take in oxygen for their life processes.
- Label the arrows to indicate whether they show the movement of oxygen or the movement of carbon dioxide through the ecosystem.



**The Nitrogen Cycle**

- Is the following sentence true or false? Most organisms use nitrogen directly from the air. \_\_\_\_\_
- The process of changing free nitrogen gas into a usable form of nitrogen is called \_\_\_\_\_.
- Is the following sentence true or false? Most nitrogen fixation is performed by plants. \_\_\_\_\_

Name \_\_\_\_\_

Date \_\_\_\_\_

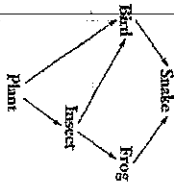
Class \_\_\_\_\_

Principles of Ecology, continued

Section 2.2 Nutrition and Energy Flow

In your textbook, read about how organisms obtain energy and about matter and energy flow in ecosystems.

Answer the questions below. Use the diagram of a food web to answer questions 1-7.



- How many food chains make up the food web?
- Which organism is an herbivore?
- Which organism is an autotroph?
- Which organism is a third-order heterotroph? To what trophic level does that organism belong?
- Which organism is an omnivore?
- Which organisms belong to more than one food chain?
- Which organism belongs to more than one trophic level?
- What are decomposers? From which trophic levels are the organisms that decomposers feed on?
- What does a pyramid of energy show about the amount of energy available at different trophic levels of a food chain?
- Why do different trophic levels have different amounts of energy?

REINFORCEMENT AND STUDY GUIDE

CHAPTER 2 BIOLOGY: The Dynamics of Life

Name \_\_\_\_\_

Date \_\_\_\_\_

Class \_\_\_\_\_

Principles of Ecology, continued

Section 2.2 Nutrition and Energy Flow, continued

In your textbook, read about cycles in nature.

Circle the letter of the choice that best completes the statement or answers the question.

- Energy that is lost at each trophic level of an ecosystem is replenished by
  - heat
  - nutrients
  - sunlight
  - organisms
- Besides energy, what moves through the organisms at each trophic level of an ecosystem?
  - organisms
  - nutrients
  - sunlight
  - cycles
- Evaporation and condensation a part of the
  - carbon cycle
  - nitrogen cycle
  - phosphorus cycle
  - water cycle
- Plants lose water to the air through
  - condensation
  - photosynthesis
  - their roots
  - evaporation
- Animals lose water when they
  - breathe in
  - urinate
  - breathe out
  - both b and c
- The water in the atmosphere is returned to the earth by
  - precipitation
  - evaporation
  - photosynthesis
  - decomposition
- Autotrophs and heterotrophs use carbon molecules for energy and
  - photosynthesis
  - growth
  - decomposition
  - both a and b
- What do plants use in photosynthesis to make carbon molecules?
  - carbon dioxide
  - carbohydrates
  - fertilizer
  - oxygen
- Heterotrophs get carbon molecules by
  - making the molecules themselves
  - feeding on other organisms
  - growing
  - decomposition
- When decomposers break down the carbon molecules in dead organisms,
  - the dead organisms are converted to coal
  - oxygen is released
  - carbon dioxide is released
  - carbon dioxide is converted to energy-rich carbon molecules
- Fertilizers provide plants with
  - nitrogen
  - carbon
  - water
  - oxygen
- Which of the following convert(s) nitrogen in the air into a form plants can use?
  - bacteria
  - lightning
  - sunlight
  - both a and b
- Plants use nitrogen to make
  - carbohydrates
  - nitrogen gas
  - proteins
  - both b and c
- An animal returns nitrogen to the environment when it
  - breathes
  - decomposes
  - uricates
  - both b and c
- Animals get phosphorus from
  - the air
  - eating plants
  - water
  - the soil
- Phosphorus in the soil comes from
  - rocks
  - decaying organisms
  - the air
  - both a and b

REINFORCEMENT AND STUDY GUIDE

CHAPTER 2 BIOLOGY: The Dynamics of Life

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

**Chapter 2 Principles of Ecology**  
**Reinforcement and Study Guide**  
 Section 2.1 Organisms and Their Environment

*In your textbook, read about what ecology is and about aspects of ecological study. Use each of the terms below just once to complete the passage.*

- ecology    biotic factors    nonliving environments    atmosphere  
 humans    organisms    soil    biosphere    abiotic factors

Living organisms in our world are connected to other (1) \_\_\_\_\_ in a variety of ways. The branch of biology called (2) \_\_\_\_\_ is the scientific study of interactions among organisms and their (3) \_\_\_\_\_, including relationships between living and (4) \_\_\_\_\_ things.

All living things on Earth can be found in the (5) \_\_\_\_\_, the portion of Earth that supports life. It extends from high in the (6) \_\_\_\_\_ to the bottom of the oceans. Many different environments can be found in the biosphere. All living organisms found in an environment are called (7) \_\_\_\_\_. Nonliving parts of an environment are called (8) \_\_\_\_\_. For example, whales, trees, and (9) \_\_\_\_\_ are biotic factors. Ocean currents, temperature, and (10) \_\_\_\_\_ are abiotic factors.

*In your textbook, read about levels of organization in ecology.*

For each item in Column A, write the letter of the matching item in Column B.

- Column A**
- A group of organisms of one species that interbreed and live in the same place at the same time
  - A collection of interacting populations
  - Interactions among the populations and abiotic factors in a community
  - Occurs between organisms when resources are scarce
  - A terrestrial ecosystem
- Column B**
- community
  - competition
  - forest
  - population
  - ecosystem

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

**Chapter 2 Principles of Ecology, continued**  
**Reinforcement and Study Guide**  
 Section 2.1 Organisms and Their Environment, continued

*In your textbook, read about organisms in ecosystems. For each statement below, write true or false.*

- A habitat is the role a species plays in a community.
- Habitats may change.
- A niche is the place where an organism lives its life.
- A habitat can include only one niche.
- A species' niche includes how the species meets its needs for food and shelter.
- The centipedes and worms that live under a certain log occupy the same habitat but have different niches.
- It is an advantage for two species to share the same niche.
- Competition between two species is reduced when the species have different niches.

Complete the table below by writing the kind of relationship described on the left.

Relationships Among Organisms	
Description of Relationship	Kind of Relationship
24. Organisms of different species live together in a close, permanent relationship.	
25. One species benefits and the other species is neither benefited nor harmed by the relationship.	
26. One species benefits from the relationship at the expense of the other species.	
27. Both species benefit from the relationship.	

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

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**Reinforcement and Study Guide**  
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