



Launch Lab

15 minutes

Where does matter go?

Matter cannot be created or destroyed but is recycled. What happens to matter that seems to vanish?

- 1 Read and complete a lab safety form.
- 2 Half fill a small **paper cup** with water. Find the mass of the cup and water using a **balance**, and record it in your Science Journal.
- 3 Use the balance to find the mass of two **effervescent antacid tablets**. Add this mass to the mass from step 2 to find the total.
- 4 Add the tablets to the cup of water. After the reaction is complete, find and record the mass of the cup and its contents. Compare this to the total mass you calculated in step 3.
- 5 Find and record the mass of a **large self-sealing bag**. Repeat steps 2 and 3, but also add the mass of the bag to find total mass. Place the cup and tablets into the bag and seal it.
- 6 Holding the cup with one hand, pick up each tablet and drop it in the water.
- 7 After the reaction is complete, find the total mass.



Think About This

1. How did the mass compare between steps 3 and 4? Between steps 5 and 7?
2. **Key Concept** Where do you think the mass of the tablets went? What observation indicates that energy was involved?

Matter and Energy

A leaf drops to the ground. Over time, bacteria and fungi break apart the chemical bonds that hold together the atoms and the molecules of the leaf. This releases energy, water vapor, and other compounds. Carbon compounds and water molecules become part of the soil. When new seedlings grow in spring, these materials enter the seedlings.

Almost all of the matter on Earth today has been here since it formed. Matter can change form, but it cannot be created or destroyed. As shown in **Figure 14**, some matter cycles through ecosystems as organisms grow, die, and decompose.

Unlike matter, energy cannot be recycled. However, energy can be converted. The chemical energy in a log converts to thermal energy and light energy when it burns.

Key Concept Check How do matter and energy move through ecosystems?

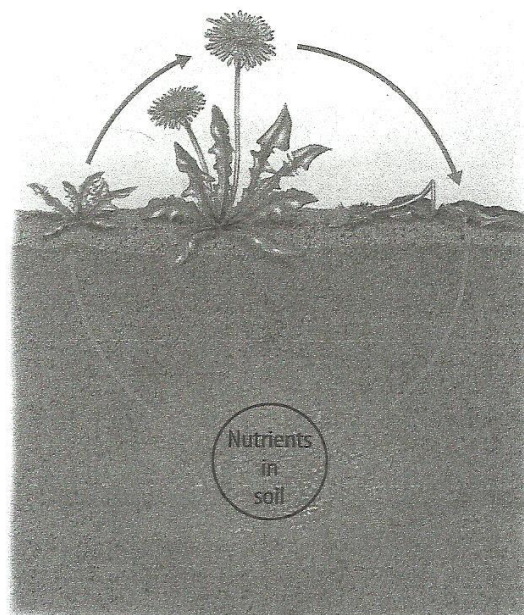


Figure 14 Matter cycles through an ecosystem as organisms grow, die, and decompose.



Obtaining Energy

When you eat a sandwich, your body gets atoms and molecules that it needs to make new cells and tissues. Your cells also get the energy they need to make proteins and carry out other life processes. All organisms need a constant supply of energy to maintain life. Where does that energy come from?

Producers


Most of the energy used by all organisms on Earth comes from the Sun. Photosynthesis is the process during which some organisms use carbon dioxide, water, and light energy, usually from the Sun, and make sugars. These sugars serve as food for living organisms.


Producers are organisms that use an outside energy source, such as the Sun, and produce their own food. The energy in food molecules is in the chemical bonds that hold the molecules together. During cellular respiration, these bonds break. This releases energy that fuels the producer's life processes. As shown in **Figure 15**, photosynthesis and cellular respiration occur throughout ecosystems.

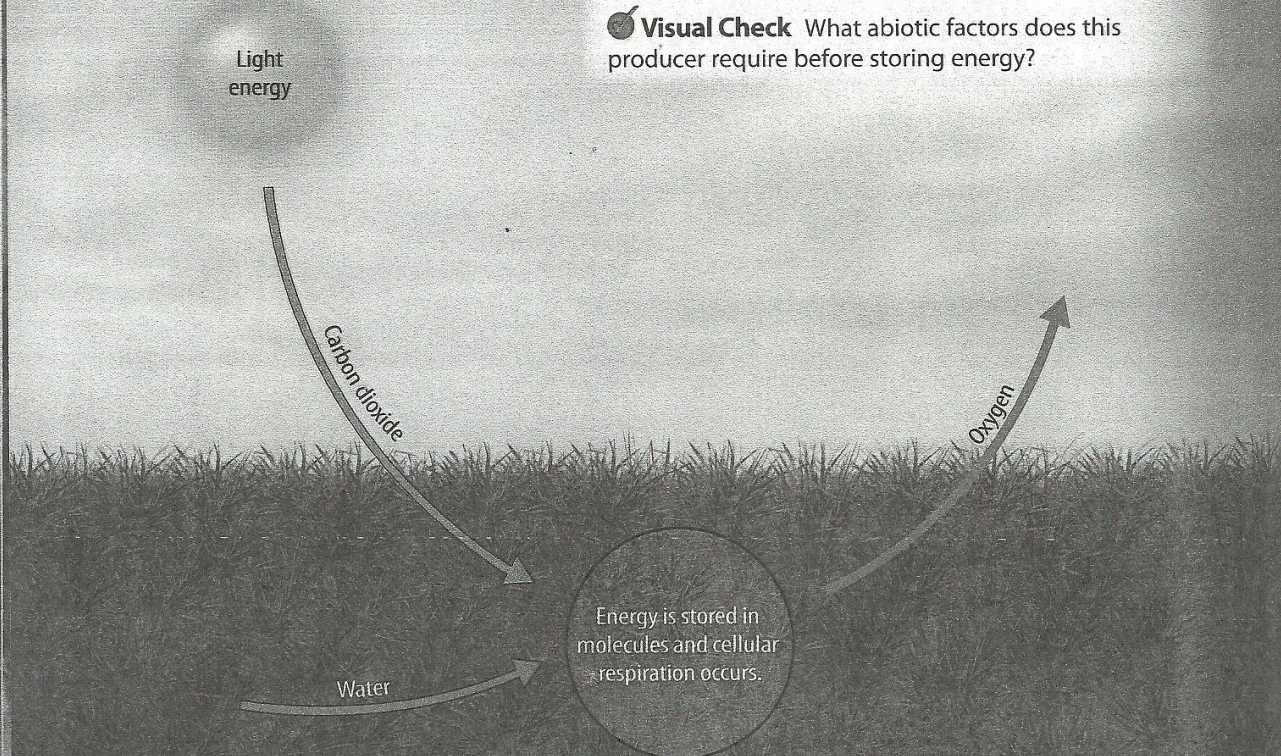
WORD ORIGIN

producer

from Latin *producere*, means "to lead or bring forth"





Figure 15  Producers use energy from the environment and make food molecules. They release waste products during cellular respiration.

 **Visual Check** What abiotic factors does this producer require before storing energy?



Consumers

The energy-rich molecules formed by producers provide food for other organisms. **Consumers** are organisms that cannot make their own food. Consumers obtain food by eating producers or other consumers. Ecosystems include several different kinds of consumers, as shown in Table 1.

	Herbivores eat only plants and other producers.
	Carnivores eat herbivores and other consumers.
	Omnivores eat producers and consumers.
	Decomposers break down dead organisms.

Herbivores eat plants and other producers. Examples of herbivores include snails, rabbits, deer, and bees. Carnivores eat herbivores and other consumers. Cats, snakes, hawks, frogs, and spiders are carnivores. Omnivores eat producers and consumers. Omnivores include bears, robins, pigs, rats, and humans. Decomposers break down the bodies of dead organisms into compounds that can be used by living organisms. Without decomposers, matter could not be recycled. Decomposers include fungi, bacteria, wood lice, termites, and earthworms.

 **Key Concept Check** How do organisms obtain energy?


Inquiry MiniLab

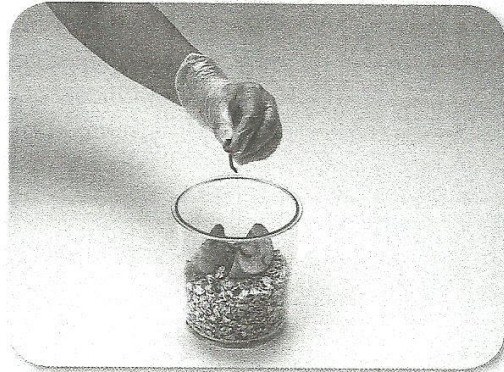
10 minutes

How do decomposers recycle nutrients in an ecosystem?




Nutrients and other materials do not simply disappear when they are used in an ecosystem. Organisms called decomposers break down waste, and it can be used again. You can observe decomposition in action.

- 1 Read and complete a lab safety form.
- 2 Half fill a **glass jar with whole, steel-cut oats**.
- 3 Add two small wedges of **apple** to the contents of the jar.
- 4 Place 3–4 **mealworms** in the jar.
- 5 Cover the contents of the jar with **strips of paper**.  Do not put a lid on the jar or cover it with anything.



- 6 Observe the activity in the jar over several days.

Analyze and Conclude

1. **Describe** what you observed in the jar over several days.
2. **Infer** what happened to the oats and the apple you placed in the jar.
3.  **Key Concept** Analyze the importance of this activity to plants and other organisms present in an ecosystem. Predict what might result if this activity did not take place.



ACADEMIC VOCABULARY

transfer

(verb) to pass from one to another

FOLDABLES®

Make a vertical trifold Venn book. Label it as shown. Use it to compare and contrast the transfer of energy in a food chain and a food web.

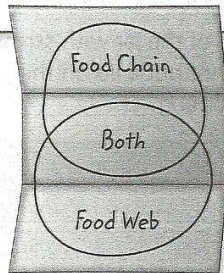


Figure 16 A vacant lot food web contains many food chains.

Transferring Energy

Not only can energy be converted from one form to another, it also can be **transferred** from one organism to another. The transfer of energy takes place in an ecosystem when one organism eats another. Food chains and food webs are models used to describe these energy transfers.

Food Chains

A model that shows how energy flows in an ecosystem through feeding relationships is called a **food chain**. A food chain always begins with a producer because producers are the source of energy for the rest of the organisms in a community. Energy moves from a producer to consumers such as herbivores or omnivores, and then on to other omnivores, carnivores, or decomposers.

A simple food chain from a community of organisms living in a vacant lot might look like this:

Grass → Mouse → Cat

The arrows show the directions of the energy transfer.

Food Webs

Most ecosystems contain many food chains. A **food web** is a model of energy transfer that can show how the food chains in a community are interconnected. For example, in the food web shown in **Figure 16**, pigeons eat berries and insects. They are prey for hawks and cats.

Key Concept Check What are the differences between a food chain and a food web?

Review

Personal Tutor

