

## Chapter 4

# Characteristics and Growth of Organisms

**Lesson 16** Classifying Plants and Animals  
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**Lesson 17** Plant Life Cycles  
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**Lesson 18** Animal Life Cycles  
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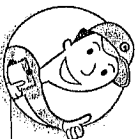
**Lesson 19** Factors That Affect Traits  
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## Chapter 4 • Lesson 16

# Classifying Plants and Animals

### Key Words

- classify • flowering plant • flower • seed • fruit • nonflowering plant • cone • spore
- backbone • vertebrate • invertebrate



### Getting the Idea

Think about putting food away in the kitchen. You sort the food into groups. Pasta may go in one cupboard and cereal in another. In the refrigerator, fruits and vegetables go in a drawer. Milk goes on a shelf. You put foods that are alike in certain ways into the same group. Scientists do the same thing with living things.

## Classifying Organisms

Scientists classify living things, or organisms. To **classify** means to sort things into groups according to their features, or characteristics. Scientists classify many organisms into two large groups—plants and animals. Scientists sort these large groups into smaller groups. Classifying helps scientists understand how living things are related to each other.

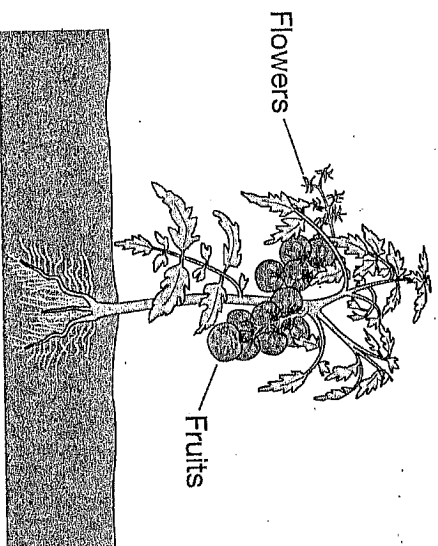
## Classifying Plants

A plant is an organism made up of many parts. A plant can make its own food. Trees, bushes, grasses, and wildflowers are examples of plants. They all take in the sun's energy and use it to make food. Scientists classify plants into two main groups—flowering plants and nonflowering plants.

## Flowering Plants

**Flowering plants** make flowers. You have probably seen different kinds of flowering plants. The flowers come in all different shapes and colors. A **flower** is a part of a plant where seeds form. A **seed** contains a tiny new plant. The seed protects the new plant and stores food to help it start growing. In some plants, the seeds are inside fruits. A **fruit** grows around the seed. Apples, plums, and grapes are examples of fruits. A tomato is also a fruit. The diagram below shows a tomato plant.

### Flowering Plant

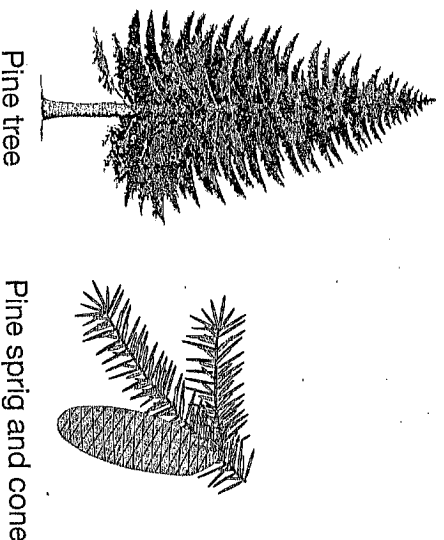


Fruits are food for animals. Animals often drop the seeds when eating fruit. A dropped seed may grow into a new plant. This helps plants grow in new places.

## Nonflowering Plants

Plants that make seeds in cones or produce spores instead of seeds are called **nonflowering plants**. These plants do not make flowers. Some nonflowering plants make seeds in cones. A **cone** is a plant part covered with scales. Seeds form on the scales of some cones. Pine, spruce, and cedar trees are all plants that have cones.

### Nonflowering Plant with Cones



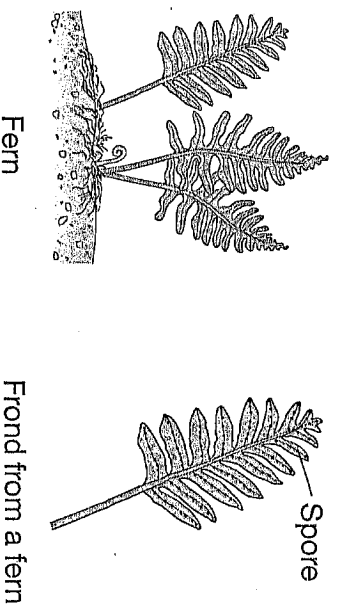
Pine tree

Pine sprig and cone

Some nonflowering plants do not make seeds. Instead, these plants release spores. **Spores** are tiny cells that can grow into new plants. Spores drop off the plant into the soil. There they may begin to grow into new plants.

Ferns, lichens, and mosses are plants that reproduce with spores. The diagram below shows part of a fern plant with spores.

### Nonflowering Plant with Spores



## Classifying Animals

Animals are organisms that also have many parts. They are different from plants because animals cannot make their own food. They must eat food to get energy. Examples of animals include dogs, flies, and worms.

Scientists classify animals into two main groups—those with backbones and those without backbones. A **backbone** is a row of connected bones down the middle of the back. These bones are called vertebrae.

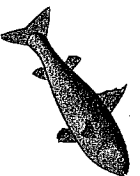


## Vertebrates

**Vertebrates** are animals that have backbones. Vertebrates share other physical features besides a backbone. Vertebrates have a covering of skin that protects them. They have a framework of bones called a skeleton inside their bodies. They have muscles that help them move. They also have blood that moves through tubes called blood vessels. And vertebrates have lungs or gills for breathing.

Scientists sort vertebrates into five smaller groups. These groups are shown below.

## Vertebrates



Fish



Amphibians



Reptiles



Birds

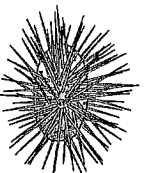


Mammals

## Invertebrates

About 95 percent of all animals are invertebrates. An **invertebrate** is an animal without a backbone. Some invertebrates have a hard covering or shell on the outside of their bodies. You can look at insects, spiders, crabs, snails, and clams for examples. Other invertebrates, such as squid and earthworms, do not have a hard covering.

## Invertebrates



Sea urchin



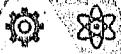
Grasshopper



Scorpion



Squid



Scientists share ideas based on information they have learned. When they share their ideas, they need to provide an explanation about them. In this activity, you are going to classify organisms. Then you will give an explanation about why you made the choices you did.

Your teacher will give you several slips of paper. Each one has a plant or animal on it. Work together with your group to gather more information about the organisms. Classify them into one of these four groups: flowering plants or nonflowering plants, and vertebrates or invertebrates.

On the lines below, write the name of each organism and its group. Explain why you placed it in that group.

1.	_____
	_____
	_____
2.	_____
	_____
	_____
3.	_____
	_____
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4.	_____
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	_____
5.	_____
	_____
	_____

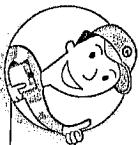
## Lesson Review

1. Which of these animals is a vertebrate?
  - A. spider
  - B. snail
  - C. worm
  - D. cat
2. Some invertebrates
  - A. have backbones.
  - B. have shells.
  - C. have fur.
  - D. can make their own food.
3. How are plants different from animals?
  - A. Plants live in water and animals do not.
  - B. Plants are not living things and animals are.
  - C. Plants make their own food and animals do not.
  - D. Plants have many body parts and animals do not.
4. Seeds can form in
  - A. cones and flowers.
  - B. cones and spores.
  - C. flowers and spores.
  - D. flowers and leaves.

# Plant Life Cycles

## Key Words

• life cycle • reproduction • seed • germinate • seedling



## Getting the Idea

Think of an orange tree that grows from an orange seed. When the tree is grown, it produces oranges with seeds. Those seeds may grow into new orange trees. Orange trees, like all plants, go through stages as they grow. They also make more of their own kind.

## What Is a Life Cycle?

All the stages of a living thing from the beginning of life to death make up a **life cycle**. All kinds of living things begin life, grow and change, reproduce, and later die. When a living thing reproduces, it makes more living things of the same kind. This process is known as **reproduction**. Every plant goes through these basic stages.

## Seeds

Recall from Lesson 16 that a tomato plant is a flowering plant. The tomato plant starts out as a **seed**. A seed is a hard object that contains two things: a tiny undeveloped plant and the food needed to feed that plant. Most seeds are small in size, but some can be very large. A coconut is an example of a large seed.

A seed will stay a seed until it is given water and warmth. The warmth usually comes from sunlight. The seed will **germinate**, or sprout, once it gets water and warmth. Then it moves on to the next step in the life cycle, the seedling.



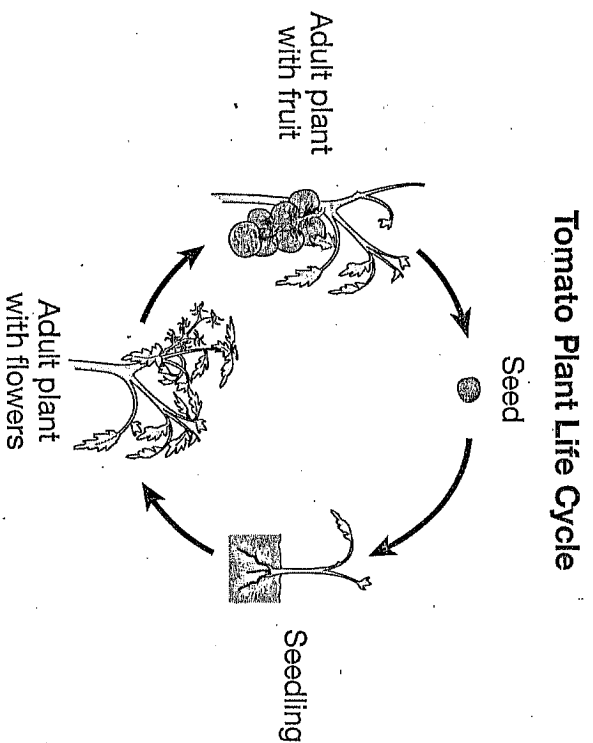
## Seedling

A **seedling** is the first sprout from a seed. Seedlings have the parts that the adult plant will need to survive in its habitat: roots, stems, and leaves. Roots help the plant get the water and nutrients it needs. The stem allows the plant to push out of the soil and start growing toward the light. The stem is also where the first two leaves form. Soon, more leaves grow on the stem and help make food for the plant.

## Mature Plant

Once the plant gets bigger and begins producing more leaves, it is considered a mature plant. Mature plants have the same structures as seedlings. They have roots, stems, and leaves. But they also have the structures that let the plants reproduce. They can make flowers or cones, which contain seeds.

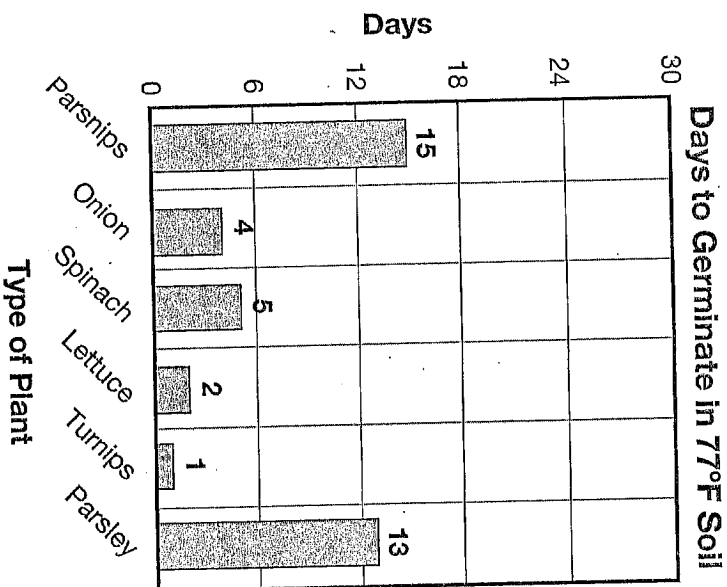
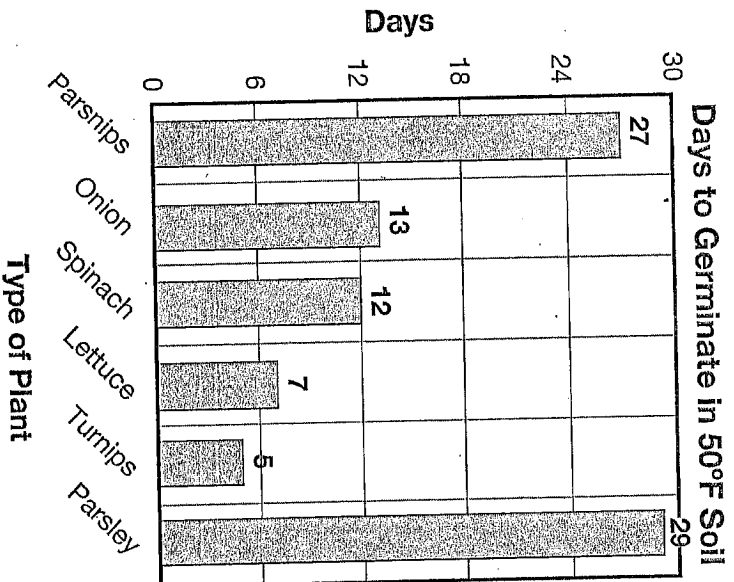
This diagram shows the life cycle of a tomato plant. All plants that make seeds to reproduce go through a life cycle like this.





Remember that graphs are helpful for analyzing and interpreting data. By comparing the heights of bars in a bar graph, you can look for patterns.

The two graphs below show the number of days it takes different kinds of plants to germinate. The graph on the left shows the results at a cooler temperature (50°F). The graph on the right shows the results at a warmer temperature (77°F).



Compare the graphs to look for any patterns.

What pattern do the data show?

Does the pattern in the data make sense based on what you learned about plant life cycles? Explain.

## Pollination

Before plants can produce seeds to start the life cycle, pollination must happen. Pollination is the spreading of pollen from one flower or cone to another flower or cone. Pollen is a fine, powdery substance. It can be spread by wind, insects, or animals. When pollen lands on a flower or cone, seeds may start to form.

### Lesson Review

1. What is the first sprout from a seed called?
  - A. seedling
  - B. mature plant
  - C. root
  - D. stem
2. What does a seed have inside it?
  - A. the pollen for the plant
  - B. water and warmth to help it grow
  - C. the flowers and cones for the adult plant
  - D. an undeveloped plant and the food for the plant

3. What do mature plants have that seedlings do not?

- A. roots and seeds
- B. leaves and stems
- C. flowers and cones
- D. sprouts and stems

4. What happens after pollination?

- A. a seed forms
- B. a stem grows
- C. roots find water
- D. leaves make food

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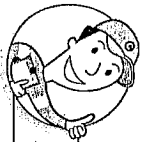
- A. a seed forms
- B. a stem grows
- C. roots find water
- D. leaves make food



# Animal Life Cycles

## Key Words

• offspring • metamorphosis • larva • pupa



## Getting the Idea

Think of baby animals you have seen. Some, such as kittens and puppies, look a lot like small adults. Other baby animals, such as frogs, do not look at all like their parents. Animals have different kinds of life cycles. As they grow from baby to adult they change in different ways.

## Life Cycles

You learned in Lesson 17 that a life cycle includes all the stages of growth in an organism. All organisms begin life, grow and change, and later die. Living things also reproduce to make more organisms like themselves.

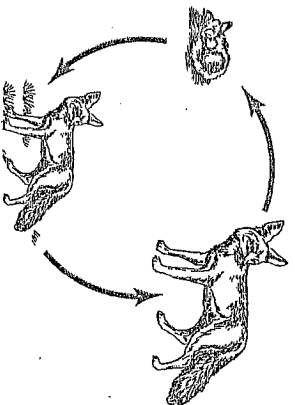
When living things reproduce, the new living things are their **offspring**. You are the offspring of your parents. Offspring are always the same kind of living things as their parents. Cats produce cats. Humans produce humans. Offspring usually look like their parents in many ways.

When reproduction happens, a new life cycle begins. The stages of growth and development are not the same for all animals. Some animals do not change form, and other animals do change form.

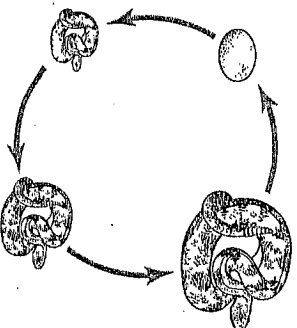
## Animals That Do Not Change Form

Some animals give birth to baby animals that look very similar to adult animals. For example, fox cubs are baby foxes. They have the same form, or shape, as an adult fox. They keep the same general shape as they grow. Their fur or color may change as they grow, but they always look like foxes.

The diagram below shows the life cycle of a gray fox. You can find gray foxes in South Carolina. Notice how the fox looks generally the same throughout its life cycle.



Other kinds of animals, such as birds, lay eggs. A baby bird hatched from an egg has the same basic form as its parents. The young of most kinds of snakes also hatch from eggs. Young snakes coming out of the egg have the same shape as an adult snake.

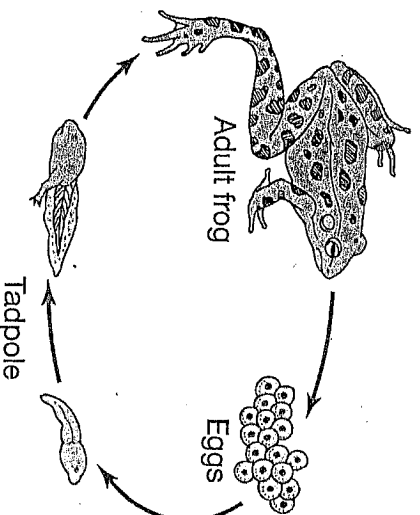


## Animals That Change Form

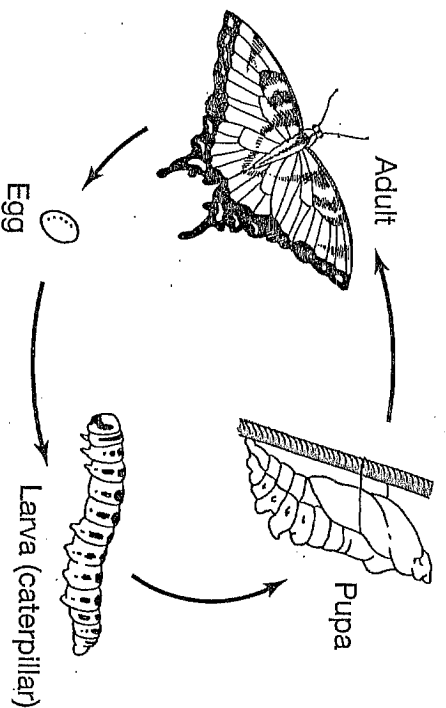
Some animals change form as they become adults. They undergo larger changes that can make them look very different as they grow. This change in form is called **metamorphosis**.

A frog is an example of an animal that changes form. A frog starts out as an egg. A female frog lays eggs in water. A tadpole hatches out of an egg. A tadpole is the young form of a frog. The tadpole lives in the water. It breathes underwater through body parts called gills. In time, it grows legs. Its tail disappears as it gets bigger. Then its gills disappear as it grows lungs. After a few weeks or months, it can breathe air and live on land. It has become an adult frog.

The drawing below shows metamorphosis in the life cycle of a frog. It has three stages—egg, young, and adult. Toads and salamanders have similar life cycles.



Some animals go through metamorphosis with four stages. Butterflies are examples of these kinds of animals. The first stage is an egg. The second stage is called a larva. The **larva** stage is a young stage of some insects. The larva of a butterfly is a caterpillar. A caterpillar eats and grows. The third stage is a pupa. In the **pupa** stage, the insect makes a hard case around itself. It changes form inside the case. When the insect comes out of the case, the insect is an adult. That is the fourth stage. The adult stage is the butterfly you see with wings.



**Lesson Review**

1. How are the life cycles of frogs and most snakes similar?
  - A. They both start out as eggs.
  - B. They both go through metamorphosis.
  - C. They both change their appearance as they grow.
  - D. They both start out in water and then move to land.
2. Which describes a butterfly during the larva stage?
  - A. It is an egg.
  - B. It is a caterpillar.
  - C. It has wings.
  - D. It lives in water.
3. How does the development of a gray fox differ from that of a frog?
  - A. A gray fox starts out as an egg.
  - B. A gray fox goes through four stages of development.
  - C. A gray fox must be born in water.
  - D. A baby gray fox looks much like an adult gray fox.
4. What do a butterfly and a frog have in common?
  - A. They both change form as they become adults.
  - B. They both go through a pupa stage.
  - C. They both have hard shells around their eggs.
  - D. They both give birth to live young.

## Factors That Affect Traits

**Key Words**

• trait • inherited trait

**Getting the Idea**

Think about the many things that make you special. You might have brown hair and brown eyes. Maybe you play the piano. Or maybe you have red hair and green eyes and make a great burrito. Every living thing has characteristics that make it unique.

**Traits**

A **trait** is a characteristic of a living thing. A plant may make pink flowers. It may produce a certain kind of fruit. The plant may have wide, round leaves. These are all traits of plants. Animals also have traits. The color of an animal's fur is a trait. The size and shape of an animal are also traits. These traits are all physical characteristics of an organism. They describe the parts of an organism.

**Inherited Traits**

Some traits are passed down from parents to offspring. This type of trait is called an **inherited trait**. A ladybug inherits its spots. A zebra inherits its pattern of stripes. An apple tree inherits the shape of its leaves, the color of its flowers, and its kind of fruit. The beaver in the diagram below inherited its big, flat tail and brown fur. An inherited trait helps distinguish one organism from another.





## Traits Influenced by the Environment

Some traits of organisms are affected by their environment. These kinds of traits do not change what kind of organism the plant or animal is. Many of these traits are not passed on to offspring.

One factor in the environment that can affect traits is temperature. It can cause changes to the size or thickness of a plant's leaves. The fur of an animal's coat might become thicker when the temperature gets colder or thinner when the temperature gets warmer. Some animals' coats change color in different seasons. The arctic fox, for example, is brown in summer. It is white in winter.

Another factor in the environment that can affect traits is injury. Both plants and animals can be injured. Injuries can cause scars. An animal may get a scar as a result of a wound. A tree may get a scar after being hit by lightning.

Some traits are influenced by the nutrients an organism gets. Animals that do not get enough food may not grow properly. They may be more likely to get sick. A plant that does not get enough nutrients from the soil may not grow as tall as it would have in better conditions.

The amount of sunlight an organism gets can also affect its traits. If the amount of sunlight a plant gets changes, the health and growth of that plant can also change. Changes to the amount of sunlight they get can also change the skin color of humans and other animals.

Remember that scientists present arguments about ideas to support a claim. They use observations and information to support their arguments. In this activity, you are going to use what you learned and what you observe to support an argument.

Your teacher is going to show you photographs of two plants. One plant was grown in sunlight. The other plant was placed in darkness for a period of time. Look closely at the plants. Pay attention to their traits, such as height and color.

How can these examples of plants support an argument that the environment influences some traits?

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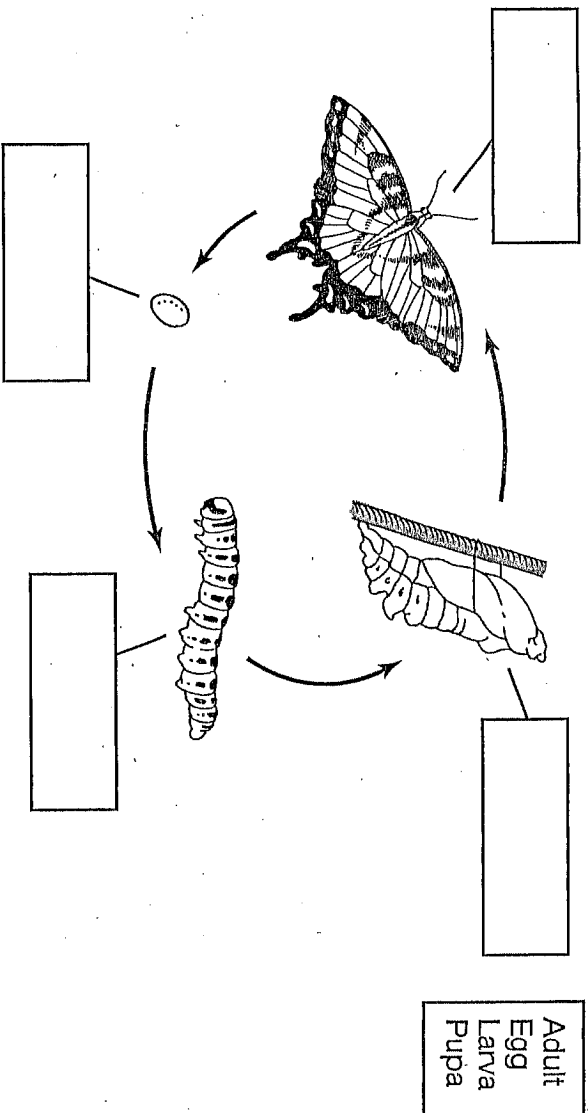
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## Lesson Review

1. Which of the following is a definition of an inherited trait?
  - A. a characteristic a living thing gets from its parents
  - B. a characteristic a living thing gets during its lifetime
  - C. a factor in the environment that can affect organisms
  - D. a factor that does not affect an organism's growth
2. Which of these traits is influenced by the environment?
  - A. blue eyes
  - B. a good sense of smell
  - C. a chipped tooth
  - D. brown hair
3. How might temperature affect an organism's traits?
  - A. It can change the type of fruit a plant makes.
  - B. It can change one kind of plant into another.
  - C. It can make an animal pass traits to its offspring.
  - D. It can make an animal's fur thickness change.
4. Which trait would an organism pass on to its offspring?
  - A. a person's ability to play the piano
  - B. short ears on an animal
  - C. a scar a person has on one hand
  - D. the short coat a dog gets after grooming

## Chapter 4 Review

1. A student is making a model to show the life cycle of a butterfly. Write the name of each stage in the correct box.



2. What must happen before a plant can produce seeds?

- Ⓐ Cones must form.
- Ⓑ Pollen must spread.
- Ⓒ Fruits must become ripe.
- Ⓓ Leaves must drop from the plant.

3. Which of these traits is passed from parent to offspring?

- Ⓐ the type of fruit a plant produces
- Ⓑ a scar an animal got during a fight
- Ⓒ a sickness an animal got as it got older
- Ⓓ the bending of a plant stem because of wind

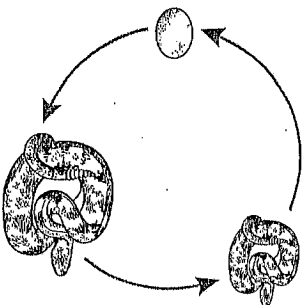
4. What do all animals have in common?

- Ⓐ They have backbones.
- Ⓑ They have hard outer coverings.
- Ⓒ They must get energy from eating.
- Ⓓ They have muscles attached to bones.

5. Which animal gives birth to a baby that looks like a young adult?

- (a) a frog
- (b) a horse
- (c) a moth
- (d) a butterfly

6. A student makes this model to show the life cycle of a snake.



Which suggestion will improve the model?

- (a) Reverse the direction of the arrows.
- (b) Show a live snake instead of an egg.
- (c) Show another egg between the two snakes.
- (d) Make the young snake look different from the mature snake.



7. What do the roots of a seedling do?

- Ⓐ They produce the leaves.
- Ⓑ They grow toward sunlight.
- Ⓒ They make the plant's stem.
- Ⓓ They take in water and nutrients.

8. What is one way temperature might affect an animal?

- Ⓐ Cooler temperatures might cause its fur to fall off.
- Ⓑ Cooler temperatures might cause its fur to change color.
- Ⓒ Warmer temperatures might cause the animal to get sick.
- Ⓓ Warmer temperatures might cause the animal to grow bigger.

9. Which is a characteristic of nonflowering plants?

- Ⓐ They do not make seeds.
- Ⓑ They do not make their own food.
- Ⓒ They make fruits that animals eat.
- Ⓓ They make either seeds in cones or spores.

10. How are mature plants different from seedlings?

- ☐ a Mature plants have roots.
- ☐ b Mature plants have stems.
- ☐ c Mature plants can reproduce.
- ☐ d Mature plants can make food.

11. Which of these is an invertebrate?

- ☐ a a bird
- ☐ b a frog
- ☐ c a worm
- ☐ d a lizard

12. The life cycles of both frogs and butterflies start with which stage?

- ☐ a egg
- ☐ b larva
- ☐ c pupa
- ☐ d adult