



SC.4.L.16.2 Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by the environment. SC.4.L.16.3 Recognize that animal behaviors may be shaped by heredity and learning.

LESSON 4

ESSENTIAL QUESTION

What Are Heredity, Instincts, and Learned Behaviors?



Engage Your Brain

Find the answer to the following question in this lesson and record it here.

How did this whale learn to hunt?



ACTIVE READING

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

Main Idea

The main idea of a paragraph is the most important idea. The main idea may be stated in the first sentence, or it may be stated elsewhere. Active readers look for main ideas by asking themselves, What is this paragraph mostly about?

Like Mother, Like Daughter

Have you ever noticed how children often look a lot like their parents? This happens because of a process known as heredity.

ACTIVE READING As you read these two pages, circle the inherited traits.

► Read about this girl's traits. Then, fill in your own traits.

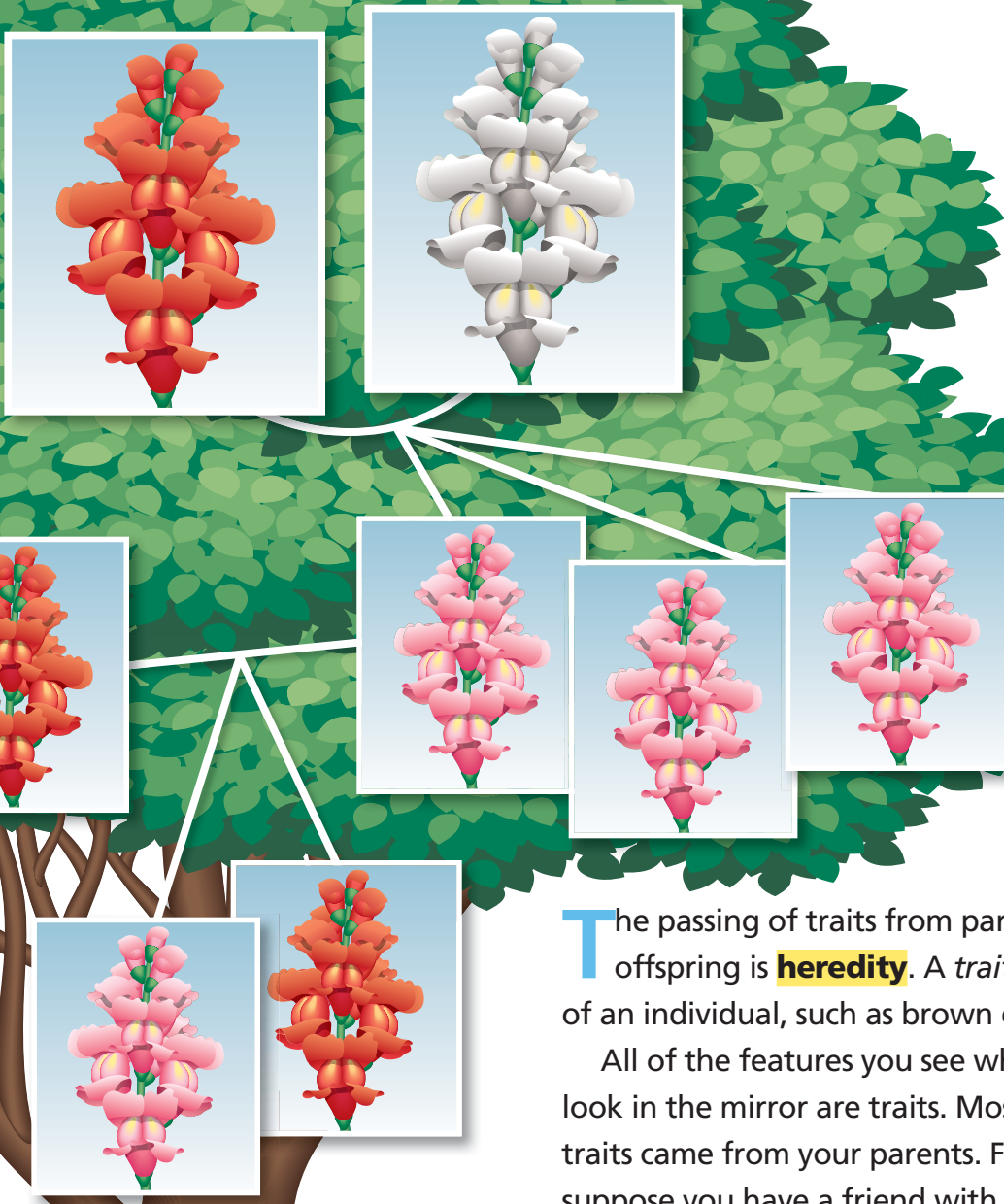
This girl's eyes are blue.
Your eye color:

This girl's hair is brown.
Your hair color:

This girl's ears have attached lobes.
Your ear lobes:

This girl's chin has no cleft.
Your chin:

Snapdragon Family Tree



Traits, such as flower color and shape, are passed down from one generation to the next.

The passing of traits from parents to offspring is **heredity**. A *trait* is a feature of an individual, such as brown eyes.

All of the features you see when you look in the mirror are traits. Most of these traits came from your parents. For example, suppose you have a friend with blue eyes. Most likely, one or both of your friend's parents also have blue eyes. Your friend inherited her eye color from her parents.

Heredity happens in other living things as well. As you can see on this page, flowers inherit their petal color from their parents. Birds inherit their beak shape. And giraffes inherit their long necks. This is why family members look similar to one other.

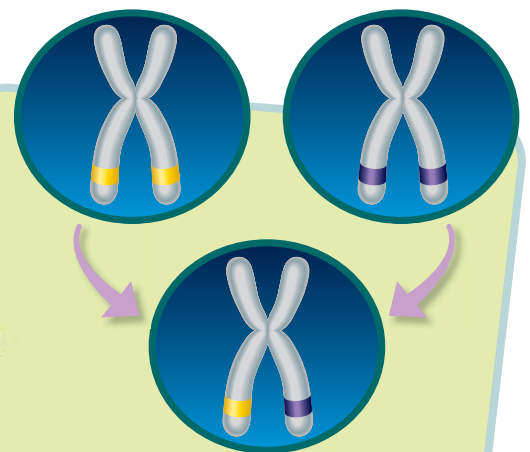
It's in the Genes

What controls the traits you inherit? Every living thing contains chemical instructions for traits. These instructions are known as genes.

ACTIVE READING Underline the main idea as you read each paragraph below.

Half of your genes came from your mother. The other half came from your father. Because of this, you have a mixture of traits from both of your parents.

Remember that a sperm is a male sex cell. It contains genes from the father. An egg is a female sex cell. It has genes from the mother. When the two sex cells join, the resulting cell has genes from both parents.



Genes [JEENZ] are found inside cells. When sex cells unite, the new cell has genes from both the sperm and the egg. This chicken's feather color is inherited.

(b) © John Mottershaw/Alamy

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► What do you think are three possible benefits of genetic engineering? What are three possible problems? Record your answers in the chart.

Benefits	Problems



The genes of these carrots have been changed so the carrots are different colors.

Genetic Engineering

Scientists have learned a lot about how genes control traits. Today, scientists can take genes from one living thing and put them in another. This is called genetic engineering. Scientists use genetic engineering to change a living thing's traits. For example, they can make a potato plant poisonous to caterpillars. Scientists can also make goat milk with medicine in it. This technology is very new. Because of this, nobody knows what the effects will be.


Mom?!
Why are my
carrots
purple?




Genes + Environment = You

Your genes alone do not control all of your traits. The environment you live in affects your traits, too!

ACTIVE READING As you read this page and the next one, put a star next to a main idea, and circle a supporting detail.



Skin color can be changed by the environment. Staying in the sun can make your skin darker. Too much sun is dangerous. Be sure to always wear sunblock.



The flower color of this hydrangea [hy•DRAYN•juh] is affected by the soil. Sometimes, the flowers are pink. If the soil becomes acidic, the flowers turn blue.



Some traits are caused when your genes and environment interact. For example, your height is controlled by genes. But it also is controlled by the kinds of foods you eat. If you did not eat nutritious food, you would not grow as tall as you could on a healthy diet.

Can you think of other traits you have that are affected by the environment?

Like you, other living things have traits caused by a mix of genes and other factors. For example, plants grow towards light. If you leave a houseplant

near a window, it will grow towards the window. No matter where you move the plant, it will start to grow towards the strongest light.

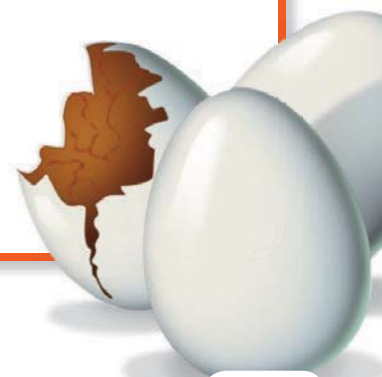
The environment can change living things in other ways, as well. For example, a tadpole is a frog larva that swims in water. If the pond tadpoles live in starts to dry up, they will undergo metamorphosis at a faster rate. They will become adult frogs faster than tadpoles left in deep ponds.



DO THE MATH

Make a Number Line

The sex of alligators is affected by temperature. If an alligator egg develops at 30°C or less, it will be a female. If it develops at 34°C or more, it will be a male. Use this information to label the temperature line below.



Learning Your Lesson

You know a lot of things. You may know how to tie your shoes, how to read a clock, and how to add numbers. You were not born knowing these things. Instead, you learned them.

ACTIVE READING As you read this page and the next, underline the examples of the skills you've learned.

Think of how learning keeps you from harm. For example, you know to look both ways before crossing the street. The ability to learn helps an animal survive. A **learned behavior** is something an animal learns from experience or by watching other animals.

▶ Pets are able to learn. What are some examples of tricks you could teach a pet?

- To sit

- To stay

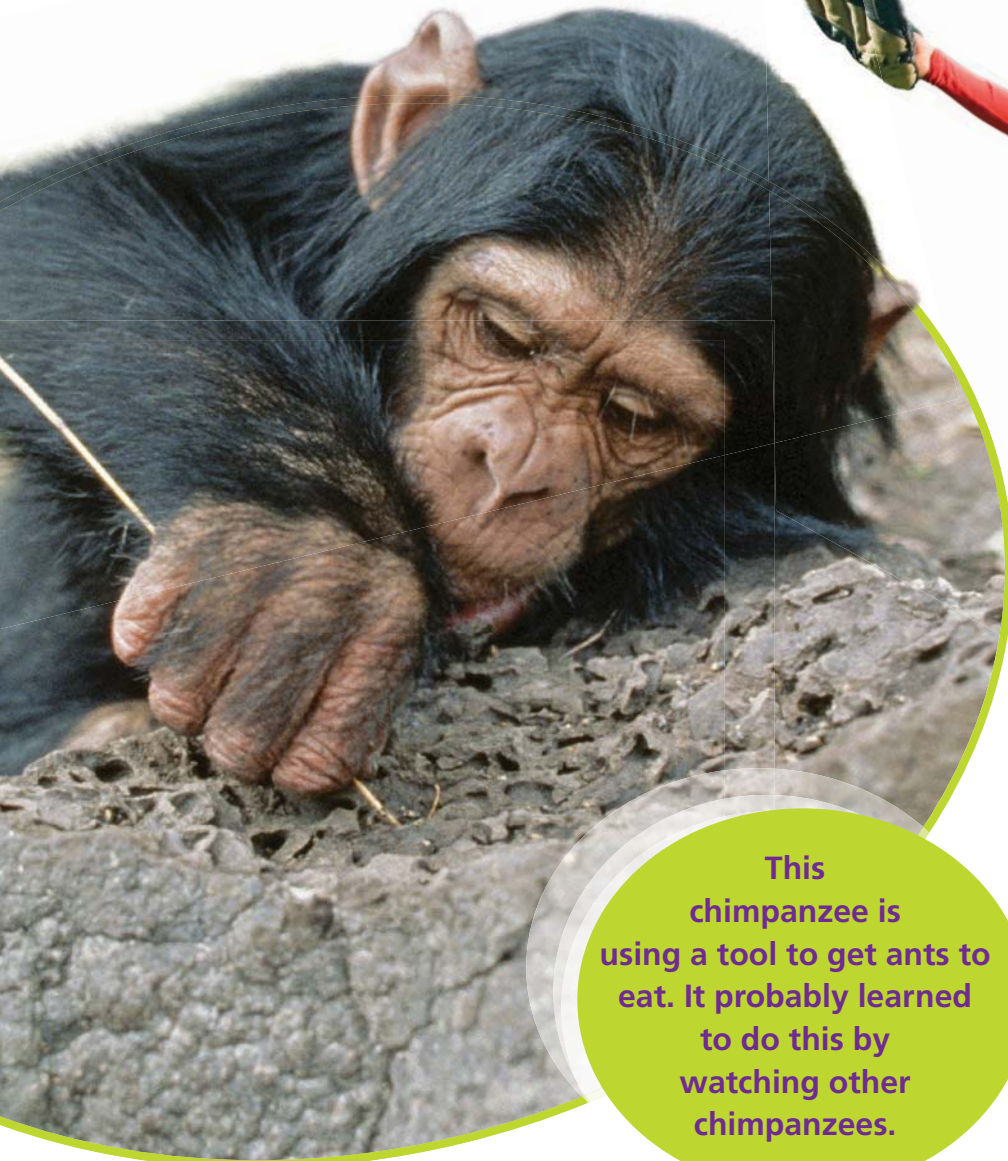
- _____

- _____

- _____



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This chimpanzee is using a tool to get ants to eat. It probably learned to do this by watching other chimpanzees.



Playing baseball is a learned behavior. You have to learn the rules of the game. You also have to learn how to hit the ball with the bat.

Many animals are able to learn things. Have you ever seen baby ducks following their mother? When the ducks first hatch, they learn to recognize their mother. After this, everywhere the mother goes, the babies follow. This helps keep the baby ducks safe.

Animals can also learn more complex behavior. Some chimpanzees learn how to make a tool for gathering termites

to eat. They learn this by watching older chimpanzees make the tool from a branch. Without watching another chimpanzee do this, a young chimpanzee will not know how to make the tool.

Can you think of other examples of learned behavior? If you have a pet, think of things you have taught your pet to do. Also think about behaviors of working animals, such as horses and rescue dogs.

Insight into Instincts

Not all behaviors are learned. Animals are born knowing how to do some kinds of things.


ACTIVE READING As you read the text below, draw a circle around all the examples of instinctive behaviors.

Behaviors that an animal is born knowing how to do are called **instincts**. Human babies have an instinct to start crying when they are hungry. Birds build nests because of instincts. Earthworms have an instinct to burrow in the ground. Like learned behaviors, instincts help an animal survive.

So how can you tell the difference between learned behaviors and instincts? Sometimes it is difficult. For example, humans have an instinct to speak a

language. However, humans must learn to speak a particular language, such as English or Spanish. In this way, many behaviors are a mix of learning and instincts.

Other behaviors may be instinct alone. For example, very soon after a baby horse is born, it is able to stand up. Within a few hours, the baby horse can walk and run. The horse does not need to learn any part of this behavior. It is all instinctive.



Calves are born with an instinct to nurse by drinking milk from their mother.



Spiders have an instinct to spin webs.



Geese have an instinct to migrate south in the winter.



► Look at the behaviors below. Which are learned and which are instincts?

	Learned	Instinct
A parrot saying, "Hello"	<input type="radio"/>	<input type="radio"/>
A fish swimming	<input type="radio"/>	<input type="radio"/>
A racehorse running down a racetrack	<input type="radio"/>	<input type="radio"/>
A ground squirrel hibernating in the winter	<input type="radio"/>	<input type="radio"/>
A bee building a hive	<input type="radio"/>	<input type="radio"/>

Sum It Up »

Use the information in the summary to complete the graphic organizer.

Living things inherit most of their traits from their parents. Inherited traits are controlled by genes. Traits can also be controlled by the environment. In animals, traits include behaviors. Instincts are behaviors that an animal is born knowing how to do. Many animals are also able to learn behaviors. They learn from experience or by watching other animals.

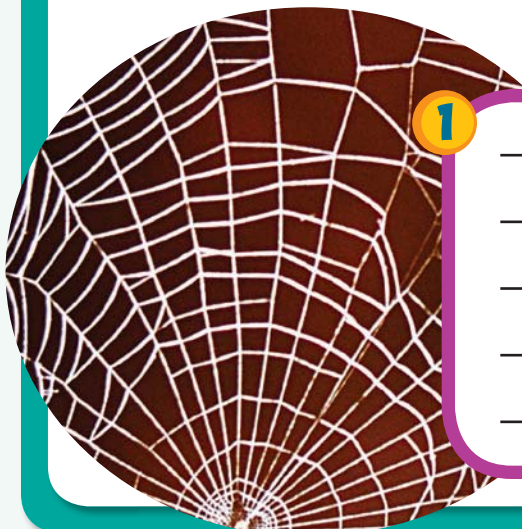
Main Idea: Heredity is the passing down of traits from parents to offspring.

Detail: The instinct to build a web is a trait passed from a spider to its young.



2

1





Name _____

Vocabulary Review

1 Use the words in the box to complete each sentence. Then use the circled letters to answer the question below.

gene

heredity*

instinct*

learned behavior*

offspring

traits

*Key Lesson Vocabulary

The passing of characteristics from parents to their young is known as

○ _ _ _ _ ○ _ _ .

An example of a _ _ _ _ _ _ _ _ _ _ ○ ○ _ _ _ _ _ _ _ _ ○
is a child learning to read.

A chemical instruction for a trait is known as a _ _ _ ○ _ _ .

Green eyes and red hair are examples of _ _ _ ○ _ _ _ ○ _ _ .

A bird chirping is an example of an ○ _ _ _ _ _ _ _ _ _ _ .

A living thing's children are also known as its ○ _ _ _ _ _ _ _ _ _ _ ○ _ _ .

Question:

Mice, ground squirrels, and other animals become inactive during the winter.
What is the name of this instinctive behavior?



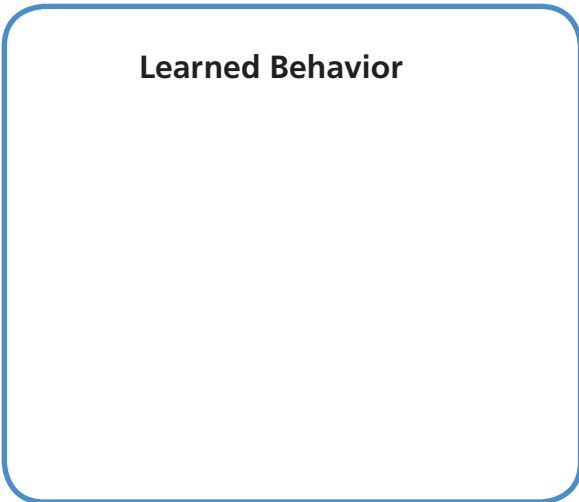
Apply Concepts

2 Explain how living things inherit traits.

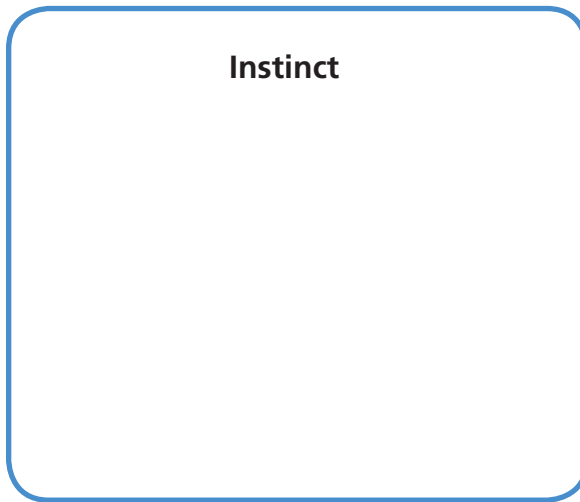
3 List three examples of physical traits affected by the environment.

4 Draw and label a picture showing a learned behavior and a picture showing an instinctive behavior.

Learned Behavior



Instinct



Take It Home!

You perform many different learned behaviors daily. Keep a journal of some of the things you do in a week. Write down how you learned that behavior. For example, if you play tennis, record who taught you to play.