

Plant and Animal Needs, Adaptations, and Responses

Plant Needs

Like all organisms, plants have basic needs that must be met if they are to survive. Plants need water, light, air, nutrients, and space, or room to grow. Plants need water, light, and carbon dioxide gas from the air in order to produce food, and they need **nutrients** in order to grow and stay healthy. Most plants get their nutrients from the soil. Nitrogen and the minerals phosphorous and potassium are important plant nutrients.

Plants depend on their environments to supply what they need. A plant's environment is all the physical things and conditions that surround the plant. It may include other living things, soil, water, sunlight, and climate.

Imagine poppies growing in a meadow. The poppies receive water from rain and light from the Sun. They take in nutrients from the soil and carbon dioxide gas from the air. The open field provides enough room for many plants to grow. The



▲ Rain is one source of water for plants. Plants must have water, as well as light from the Sun and carbon dioxide from the air, to make food.

meadow environment meets all the basic needs of the poppy plants.

Plants grow in many environments around the world. However, different kinds of plants are better suited to different environments. For example, orchids grow well in a warm, humid rain forest, while cactus plants thrive in the dry conditions of a desert.

✔ What five resources does a plant require in order to live and grow?

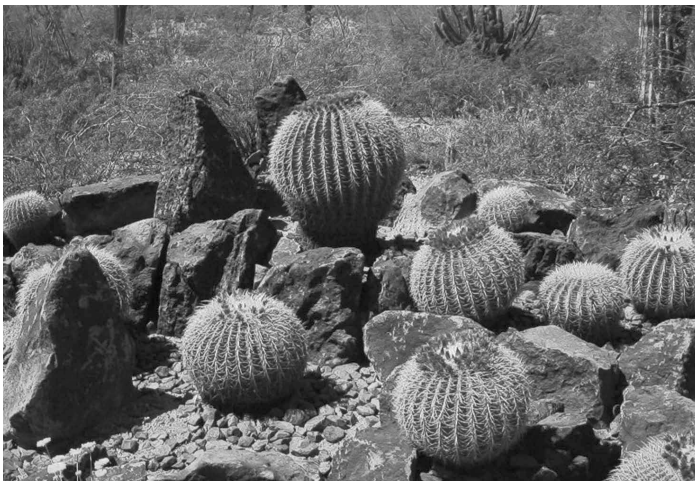
Like all plants, these poppies need water, light, air, nutrients, and space. They must get everything they need from their environment. ►



Plant Adaptations

A structure or behavior that helps an organism survive in its environment is called an **adaptation**. Many characteristics of plants are adaptations. Recall that plants depend on their environments to satisfy their needs. An environment has limited amounts of resources—materials that organisms can use to meet their needs. Some plant adaptations help a plant compete for those resources. Other adaptations may help a plant protect itself or reproduce. Adaptations give the plant a better chance for survival.

Desert plants have adaptations that help them survive in dry climates. A cactus may store water in its thick stem. Some desert plants have shallow roots that stretch in many directions. When it rains, they can quickly absorb water from a large area.



▲ Barrel cactus plants are adapted to living in the desert. Their thick stems can store water to use during the long periods between rainfalls.

Rain forest plants are adapted to their wet, crowded environment. Many have slick leaves with grooves and pointed tips. These adaptations help them shed water so the leaves do not get moldy and rot and the branches do not get weighed down. Rain forest trees often have smooth bark that helps prevent other plants from clinging to them. Such clinging plants may weaken the trees with their heavy load and may also climb high enough to compete for sunlight.

Many plant adaptations are for protection against plant-eating animals. The sharp thorns on rose and raspberry bushes are this type of adaptation. If a giraffe grazes for too long on an acacia tree, the tree pumps a bitter-tasting substance into its leaves.

✔ Define *adaptation* and describe a plant adaptation.



▲ The acacia tree has developed useful adaptations that discourage giraffes and other animals from eating too many of its leaves.



- ▲ The stems of these houseplants are bent because the plant is responding to light coming through the window. This response is called phototropism.

Plant Responses

Plants do not move from place to place as animals do. However, something in a plant's environment may cause the plant to bend or grow in a certain direction. Such movements are **responses**, or reactions, to changes in the surroundings. By sensing and responding to changes, a plant may continue to get what it needs from its environment.

Plant responses to factors in the environment are called *tropisms*. The most common tropisms are in response to light, gravity, and touch.

Growing toward or away from light is a response called phototropism. In most plants, the leaves and stems grow toward light, while the roots grow away from light.

REFLECT ON READING

Create a cause and effect chart like the one on page 20. Write either *light*, *gravity*, or *touch* in the cause box, and then consider how a plant responds to that cause. Put your ideas in the effect box.



- ▲ Thigmotropism is a response to contact. Climbing pea plants have tendrils that wrap around wires or poles as the plants grow.

Gravitropism is a response to the pull of Earth's gravity. Roots grow down in the same direction as gravity's pull, while stems grow up, in the opposite direction. If a plant tips over on its side, its stem will begin to grow upward again, away from the pull of gravity.

Thigmotropism is a movement in response to contact, or touch. Climbing plants such as bean plants and ivy vines cling to a wall, pole, or tree trunk because of thigmotropism.

- ✓ Sunflowers turn to follow the Sun's movement throughout the day. What kind of tropism does this demonstrate?

APPLY SCIENCE CONCEPTS

Choose two plants you observe growing at home or around your neighborhood. Write a description of one part of each plant. Explain how the part might be an adaptation that helps the plant survive.

Animal Needs

What do you need in order to survive? Even though you are very different from an ant or a whale, you have the same basic needs as other animals: food, water, air, shelter, and space. An animal must get what it needs from its environment. An animal's **environment** is all the physical things and conditions that surround the animal, such as soil, air, water, plants, other animals, and weather.

Food provides animals with energy to live and with nutrients. Nutrients, such as vitamins and minerals, are used by an animal's body for growth and repair. All animals rely on plants for food. Most plants can use energy from sunlight, the gas carbon dioxide, and water to produce their own food, which is something animals cannot do. To obtain food, animals must eat plants or other animals.

Animals cannot survive without water. An animal's body cells consist mostly



▲ Animals cannot survive without food, which they get by eating plants or other animals.

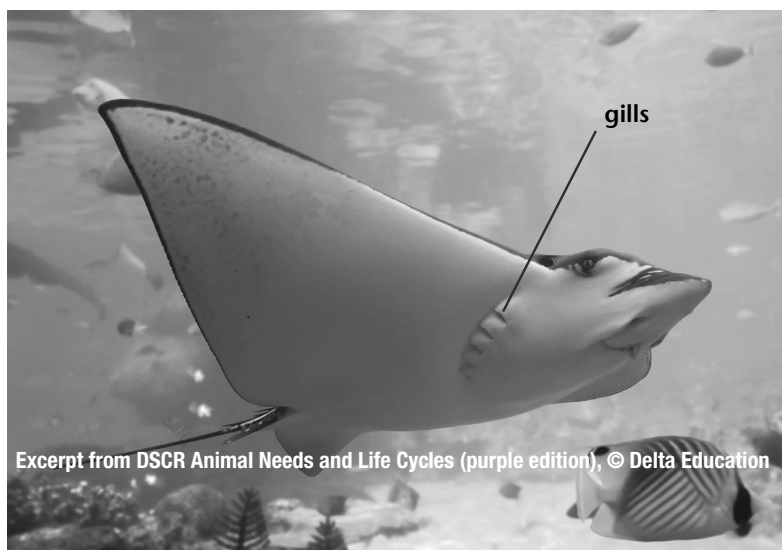
of water. Many animals obtain water by drinking it or by eating food that contains water.

Air contains **oxygen**, a gas that all animals need. Their body cells use it to release the energy stored in food. Many land animals have lungs that help them breathe in oxygen from the air. Many water animals, such as fish, have gills that help them obtain oxygen from the water. Some water animals, such as whales, have lungs and must travel up to the surface to breathe.

Animals can meet their need for water by drinking it or by eating food that contains water. ▼



Stingrays and many other aquatic animals have body structures called gills. Gills help these animals obtain the oxygen they need from the water around them. ▼





◀ Eucalyptus trees are a resource that koalas depend on. Koalas living in the same area may compete for eucalyptus leaves to eat.

Animals also need shelter and space to live. Shelter provides protection against weather and predators. Predators are animals that hunt and eat other animals, which are called prey. Many foxes dig burrows, and bats may seek shelter in caves. Humans need shelter, too. Apartments, houses, and tents are some forms of shelter.

The things in an environment that an animal can use to meet its needs are called *resources*. For example, eucalyptus trees are a resource for koalas. Koalas are animals that live in eastern Australia. Koalas obtain food by eating the leaves of eucalyptus trees. One koala can eat about 1 kilogram (more than 2 pounds) of leaves each day. This amount of leaves also contains enough moisture

to meet the koala's needs for water. The eucalyptus trees also provide the koalas with shelter from the sun and protection from enemies.

The availability and quality of resources affect an organism's health and development. If many animals share the same resources, a struggle called **competition** can occur. For example, if many koalas live in the same area, they might have to compete for eucalyptus leaves to eat. Competition for resources can occur among individuals of the same species, and it can occur among different species.

✓ What are the five main things all animals must have in order to survive?

REFLECT ON READING

Before reading, you previewed book features such as the charts on pages 5 and 7. How did those charts help you better understand the different types of animals?

APPLY SCIENCE CONCEPTS

Like other animals, humans have some basic needs we must meet in order to survive. What are some resources in our environment that we use to meet these needs?



▲ Thick fur is an adaptation, or helpful trait, that these sea otters received from their parents.

Ways Animals Meet Their Needs

Imagine some sea otters swimming beside huge chunks of ice off the coast of Alaska. These amazing animals survive in the frigid water with the help of their thick fur coats. An otter's thick fur is an example of an **adaptation**, a characteristic that helps an organism survive in its environment. Adaptations can be physical

characteristics, such as body structures, or they can be behaviors.

The adaptations of a species take many generations to develop. A sea otter with thick fur has a better chance of surviving in the extreme cold than an otter with thin fur. In the past, sea otters with thick fur survived. They reproduced and passed this **trait**, or characteristic, to their offspring. The passing of traits to offspring is called **heredity**. Over many generations, the species changed so that now all sea otters have thick fur.

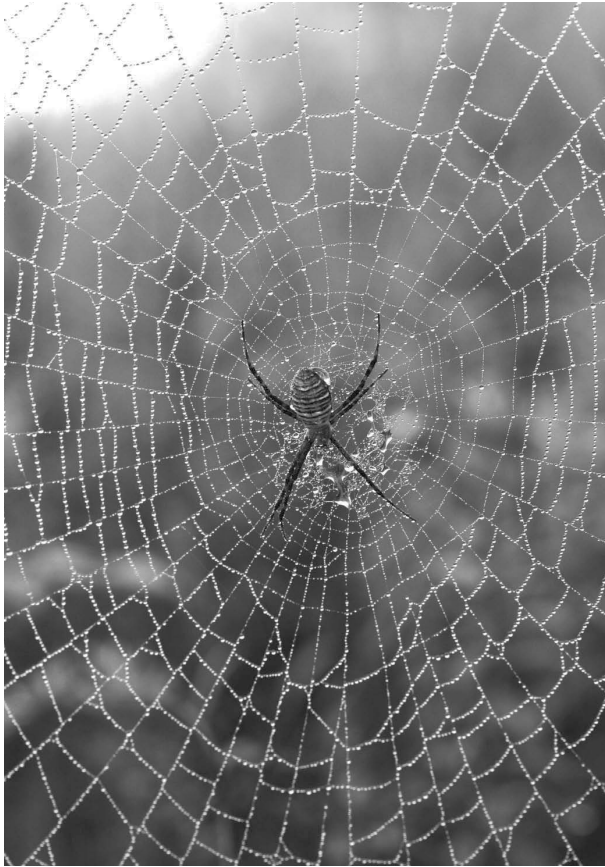
Thick fur is an example of a *structural adaptation*, a physical characteristic that helps an animal meet its needs. The webbed feet of some birds are structural adaptations that help these animals move quickly in the water. An elephant's long, muscular trunk helps it breathe, smell things, grasp food to eat, and spray water and dust on its back to protect its skin from the sun.

A pelican's webbed feet are a structural adaptation that helps the animal paddle through the water. ▼

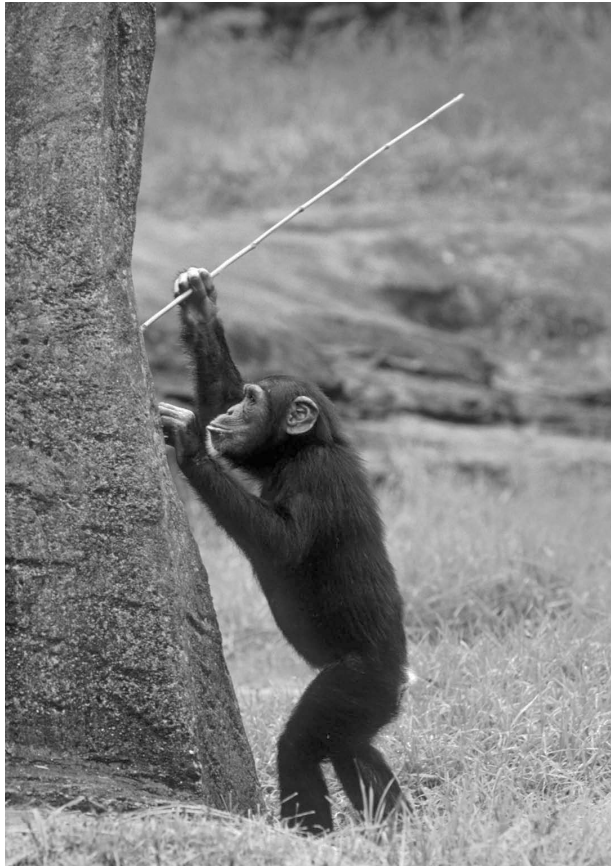


An elephant's trunk is a structural adaptation that acts like a combination of a nose and a hand. ▼





▲ A spider's ability to spin a web to catch insects to eat is an instinct. Spiders do not have to learn how to behave this way.



▲ A chimpanzee's ability to use a stick as a tool to catch insects is a learned behavior.

Animals also have *behavioral adaptations*, which are behaviors or activities that help them survive. Many behaviors are **instincts**—behaviors that animals do automatically. Instincts are inherited traits that animals are born with. A spider instinctively spins a web, which is a behavior that helps the spider catch insects to eat. Many birds and other animals instinctively build nests, which is a behavior that helps them have and care for their young. Animals often have instincts for obtaining food, avoiding enemies, protecting their young, and responding to changes in their environments.

In addition to having instincts, animals have **learned behaviors**. Unlike instincts, learned behaviors are not inherited from an animal's parents. They are behaviors that an animal learns either through experience or by watching others. A chimpanzee may learn to use a stick to catch insects by watching another chimpanzee behave this way. Other examples of learned behaviors are pets learning to do tricks and humans learning to read or to ride a bike.

✔ Describe one example of a structural adaptation and one example of a behavioral adaptation.

Finding Food

Most animals have structural adaptations for obtaining food in their environments. A tiger is a predator that has powerful legs and a flexible backbone. These structural adaptations help the tiger run and jump. Its padded feet help it move quietly, and its sharp claws and teeth help it catch and eat its prey.

A bird's beak or bill shape can help it obtain food. A mallard duck has a rounded bill with a kind of fringe along the edge. This adaptation works like a strainer, helping the duck filter small plants, seeds, and insects to eat from the water in a pond or a lake.

Migration Some animals **migrate**, or travel to another area, to locate food.

Migration is an instinct. Many birds migrate to warmer areas for the winter, since food can be scarce when the weather is cold. When winter begins in the Arctic, arctic terns migrate south to the Antarctic. It is summer there and food is easier to find.

Animals also migrate to find safer places to breed or raise their young. When summer ends in the Antarctic, arctic terns fly north again to nest. These amazing birds fly about 35,400 kilometers (about 22,000 miles) every year!

✔ Describe two examples of adaptations that help animals find or obtain food.



▲ A tiger's powerful jaw and long, sharp front teeth are structural adaptations that help it catch and eat other animals.



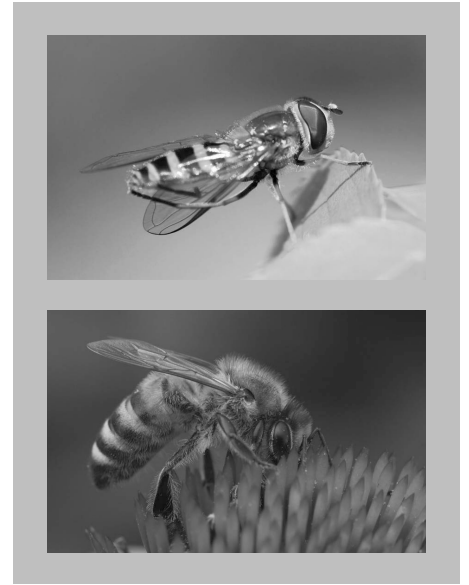
▲ The arctic tern makes the longest yearly migration of any bird. During its life, an arctic tern may fly farther than the distance from Earth to the Moon and back.



▲ A leafy sea dragon is protected by camouflage. Its body color and shape make it hard to see when it is in seaweed.



▲ A snowshoe hare's fur is white in the winter. This camouflage makes it hard for predators to see the hare in the snow.



▲ The hoverfly (top) does not sting, but it looks similar to the honeybee (bottom), which does. The hoverfly's appearance is an example of mimicry.

Staying Safe From Enemies

Many different structural and behavioral adaptations help protect animals from predators. Hard shells or scales are protective body structures that can serve as shields. Strong muscles can help animals run away from enemies. Behavioral adaptations such as playing dead when threatened or living in groups also help animals avoid predators.

Camouflage A structural adaptation that protects an animal by causing it to blend in with its environment is called **camouflage**. A prey animal with camouflage is more difficult for a predator to find. For example, the body color and shape of a fish called a leafy sea dragon match the seaweed in its ocean environment. A predator swimming by

might not see it. A snowshoe hare's fur is white in the winter, which helps it blend in with the snow and avoid predators. During the summer, the hare has grayish brown fur, which helps it blend in with rocks and soil.

Mimicry A structural adaptation that protects an animal by causing it to resemble a different, often more dangerous, animal is called **mimicry**. Predators are more likely to avoid prey animals that have this kind of adaptation. For example, hoverflies have black and yellow stripes. The hoverfly cannot sting, but other animals may mistake it for a stinging honeybee and leave it alone.

✓ Explain how camouflage helps some animals survive.

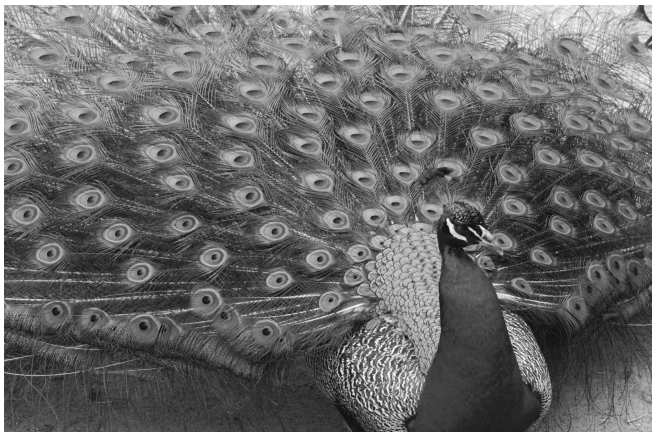
Having and Caring for Young

In order to reproduce, animals must find mates. Different animals have different structural or behavioral adaptations for attracting mates. Some male birds have colorful feathers, an adaptation that helps them attract the attention of female birds. In some species, a male bird may give a female gifts of pebbles or sticks needed for nest building.

Animals also must create or locate safe places to have and care for their young. Some animals build nests to protect their eggs. Animals also may migrate so they can lay their eggs in safer places. Most salmon live a large part of their lives in the ocean, but they swim up into streams to lay their eggs. Streams offer a more protected environment than the ocean, so the offspring of the salmon have a greater chance of survival.

Many animals have structural adaptations that help them care for their

To help attract mates, peacocks display their colorful tail feathers. ▼



young. For example, kangaroos have pouches that allow them to carry their young with them.

A unique behavioral adaptation helps keep emperor penguin eggs from freezing on the ice. The penguins come ashore during the winter to mate. After laying their eggs, the females make the long journey back to the sea to gather food. The males stay behind and keep the eggs warm. Each male holds an egg on his feet for two months until the baby penguin hatches!

✓ Describe two behaviors that help animals create or locate safe places to have their offspring.

A young kangaroo, or joey, rides in its mother's pouch. The pouch provides protection for the young kangaroo. ▼



Responding to Environmental Changes

The temperature, rainfall, and availability of food in an animal's environment can change from day to day or from season to season. In order to survive, animals must respond to changes in their environments.

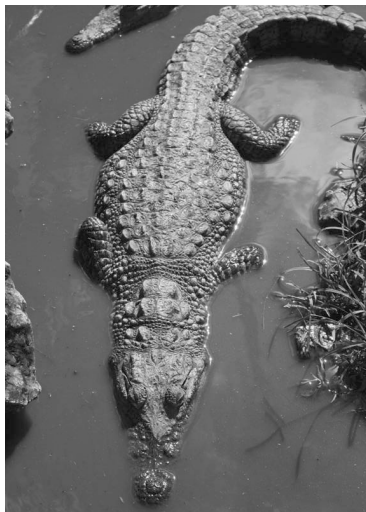
Crocodiles are cold-blooded. A crocodile must control its body temperature by moving around within its environment. If the weather heats up, a crocodile may need to respond by cooling down in water or mud. If a crocodile is too cold, it may need to bask in the sunshine.

Hibernation Recall that some animals migrate to warmer locations for the winter

to find food. Other animals **hibernate**, or go into a sleep-like state, to survive cold winters when food and water are scarce. Hibernation is an instinct. During hibernation, an animal's body temperature decreases, its breathing and heart rate slow down, and its body uses less energy. Woodchucks, ground squirrels, bats, and dormice are examples of animals that hibernate. Other animals sleep a great deal more in the winter, but they are not true hibernators. Bears, raccoons, and skunks behave this way.

✓ What happens to an animal's body during hibernation?

A crocodile controls its body temperature by moving to cooler or warmer areas in its environment. ►



▲ By hibernating, a dormouse can survive a long, cold winter, when very little food is available.

REFLECT ON READING

Create a concept web like the one on page 10 to organize information about adaptations. Write the main idea about adaptations in the center. Add at least four details that support the main idea.

APPLY SCIENCE CONCEPTS

Camouflage is an adaptation that helps some prey animals avoid predators. Write a paragraph in your science notebook, telling how camouflage could also be a helpful adaptation for a predator to have.

Name _____ Date _____

Traits for Survival

1. What is an adaptation?

the procecss of the
animals

2. The sharp spines on a cactus prevent animals from eating the plant. Do you think this is an example of an adaptation? Explain your answer.

food

3. Explain what the two main types of animal adaptations are and provide an example of each.

bear lion tiger frog