

## Chapter Quiz

Write your answers on a separate sheet of paper.

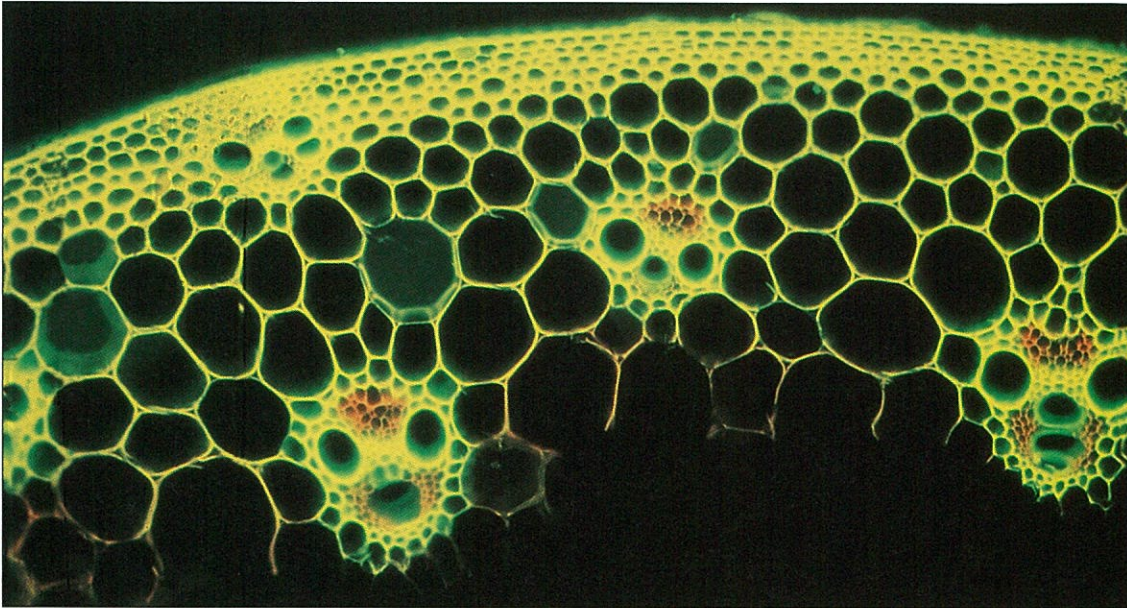
1. How is an animal different from a plant?
2. How are invertebrates different from vertebrates?
3. How are parasites and hosts related?
4. What are three examples of mollusks?
5. What are the three segments of an insect's body?
6. How are spiders different from insects?
7. How are fish different from mature amphibians?
8. What are three examples of reptiles?
9. What kind of bones do birds have that make flying easier?
10. How are mammals different from other vertebrates?

### Test Tip

Always try to write answers in complete sentences. This helps improve the quality of your thinking as well as that of your writing.

### Research Project

You may have heard of a flock of sheep or a herd of cows. *Flock* and *herd* are the group names for these animals. Other kinds of animals have different group names. Research the group names for the following animals: geese, gorillas, fish, chicks, quail, lions, ants, and wolves. Make a chart that lists each animal and its group name.



*Tiny tubes inside a plant's stem carry water, minerals, and food to other parts of the plant. What other plant parts do you know about?*

## Learning Objectives

- Explain how plants differ from animals.
- Explain the function of seeds, roots, stems, and leaves.
- Describe photosynthesis.
- Identify the parts of a flower and their functions.
- Describe what happens during pollination.
- Describe the process of fertilization.
- Describe the process of seed germination.
- Explain the function of fruits for seed plants.
- LAB ACTIVITY: Compare how different environments affect seed germination.
- SCIENCE IN YOUR LIFE: List common items that are made from trees.

## Words to Know

<b>seed</b>	the part of a seed plant from which a new plant can grow
<b>root</b>	the part of a plant below the surface of the soil; used to hold the plant in place, store extra food, and soak up water and minerals from the soil
<b>stem</b>	the upright part of a plant; used to carry food and water and hold a plant up so its leaves can get sunlight
<b>leaf</b>	the food-making part of the plant
<b>photosynthesis</b>	the process that plants use to make food in the form of sugar
<b>pistil</b>	the female part of a flower
<b>egg cell</b>	a female sex cell
<b>stamen</b>	the male part of a flower
<b>pollen</b>	the light, powdery dust in stamens that contains the male sex cells
<b>sperm cell</b>	a male sex cell
<b>petal</b>	one of the colorful outer parts of a flower; it attracts insects
<b>pollination</b>	the process of transferring pollen from the stamen of a flower to the pistil of the same or a different flower
<b>fertilization</b>	the process of a sperm cell and an egg cell joining
<b>germination</b>	the process by which a tiny new plant breaks through the hard seed coat that is protecting it
<b>fruit</b>	the part of a plant that holds the seeds

## 7-1

## Plants as Food Makers

## Words to Know

<b>seed</b>	the part of a seed plant from which a new plant can grow
<b>root</b>	the part of a plant below the surface of the soil; used to hold the plant in place, store extra food, and soak up water and minerals from the soil
<b>stem</b>	the upright part of a plant; used to carry food and water and hold a plant up so its leaves can get sunlight
<b>leaf</b>	the food-making part of the plant
<b>photosynthesis</b>	the process that plants use to make food in the form of sugar

## What Are Plants?

Plants are organisms made of many specialized cells. They are different from animals in three very important ways:

1. Plants make their own food.
2. Plant cells have cell walls.
3. Plants cannot move from place to place.

There are about 265,000 kinds of plants. You can see some of them on a walk through a park. Plants you might see include trees, grasses, ferns, bushes, flowering plants such as roses and daisies, and mosses. Plants grow in most places—from the desert to the mountains. Some even grow in water.

We owe a lot to plants. Without them, humans and all other animals could not survive. We would have no food to eat and no air to breathe. In this chapter, we will see why animal life would be impossible without plants.

 How are plants different from animals?**Remember**

A cell is the smallest, most basic unit of life. A cell wall is the thicker covering around a plant cell membrane.

## Seed Plants

Most of the plants you see around you are *seed plants*. These are the kind you will study in this chapter. The parts of seed plants are seeds, roots, stems, and leaves.

### Seeds

The **seed** is the part of a seed plant from which a new plant can grow. Some kinds of seed plants produce flowers. These plants produce seeds inside the fruit. Avocados, daisies, and plum trees are examples of flowering seed plants. Another kind of seed plant produces cones. The seeds are inside the cones. Pine trees produce cones. Seeds are important in plant reproduction.

### Roots

Below the surface of the soil is the plant's **root**. Roots have several jobs. One job is to hold the plant in place. Roots also store extra food that the plant has made. However, the most important job of roots is to soak up water and minerals from the soil. Water enters a plant through its roots. From the roots, water moves to other parts of the plant. Sugar beets and carrots are examples of roots.

### Stems

The **stem** is the upright part of a plant. It starts at the ground and goes up to the leaves. The stem holds a plant up so its leaves can get sunlight. It also carries water and food through long, narrow tubes that go up and down the stem. First, the roots soak up water. Then the water is carried up the stem to other parts of the plant. Some of the food that plants make is sent down the stem to the roots.

Some stems are soft and flexible, like the stem of a daisy. Other stems are hard and rigid, like the stems of trees and shrubs. These are woody stems. The wood is made of cells with thick walls. The stems of trees are called *trunks*.

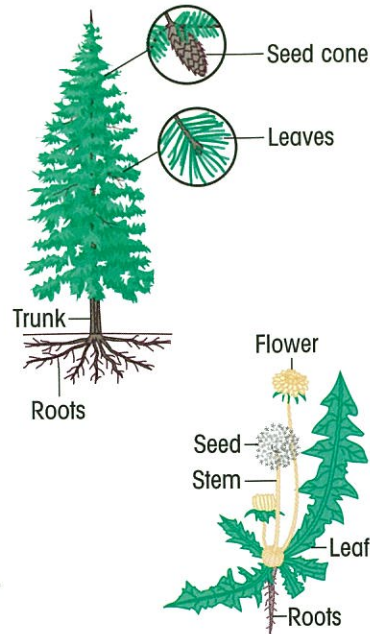


Figure 7-1 *Seed plants*

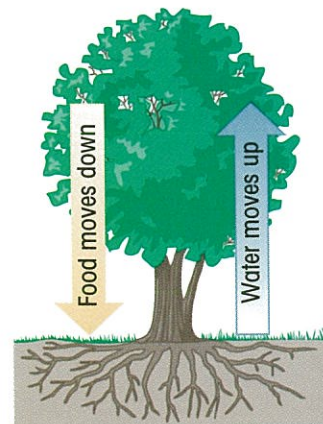


Figure 7-2 *In a tree, water moves up the trunk. Food moves down.*

You have probably eaten plant stems. Asparagus, bamboo shoots, and sugar cane are all stems. Potatoes are also stems. Many people think they are roots because they grow under the ground. However, potatoes are really just underground stem structures that store extra food.

### Remember

Chlorophyll is a green material stored inside plant structures called chloroplasts.

### Leaves

The **leaf** is the food-making part of a plant. Plants make their own food, using chlorophyll. Most of a plant's chlorophyll is found in its leaves.

The process that plants use to make food, in the form of sugar, is called **photosynthesis**. Four things are needed for photosynthesis: sunlight, water, chlorophyll, and carbon dioxide. Carbon dioxide is a gas in the air. It is made of carbon and oxygen molecules. Here is how photosynthesis works.

1. Water goes from the soil through the roots and stems to the leaves.
2. Carbon dioxide from the air enters small openings on the undersides of the leaves.
3. As sunlight strikes the chlorophyll in the leaves, energy is released.
4. This energy makes the carbon dioxide and water join together to make sugar and oxygen.

### Science Fact



The spines of a cactus plant are really modified leaves. They protect the plant from animals that would eat it. The spines also prevent the plant from losing too much water in the hot, dry desert.

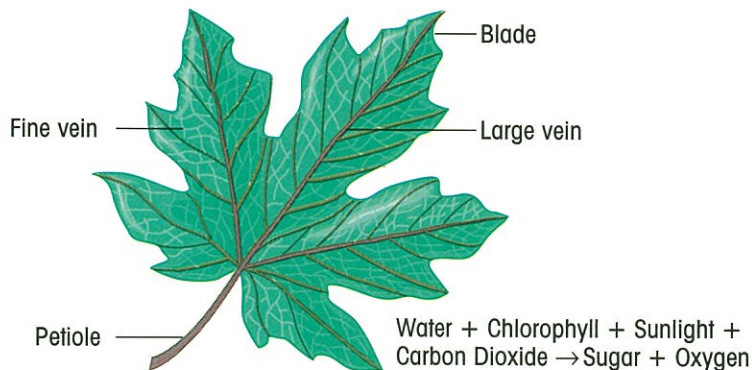


Figure 7-3 *The leaf of the plant is where food is made. The process is shown in the formula above.*

The sugar that plants make is not the kind of sugar you buy at the store. It is the basis of all food. Plants use the energy stored in sugar to carry out life processes. Animals eat the plants and get the energy stored in this sugar. People eat the animals or the plants and also get the energy. So you can see that *all* animals depend on photosynthesis for food.

Animals also get oxygen from photosynthesis. Remember that animals need oxygen to get energy from food during cellular respiration. After the plant sugar is made, there is some oxygen left over. This goes out of the plant through small openings on the underside of leaves. Without plants covering the Earth and releasing oxygen, animals could not breathe.



*Small openings on the underside of leaves let oxygen, carbon dioxide, and water move in and out.*

✓ **What are the jobs of seeds, roots, stems, and leaves on plants?**

## **Insect-eating Plants**

There are a few plants that actually eat animals! These plants live in soil that does not have everything the plants need to grow. So the plants catch insects to get what they need.

The pitcher plant has leaf parts that are shaped like pitchers. These parts are lined with brushlike hairs. The hairs point down into the pitcher. When an insect comes along, it gets trapped in the hair and cannot get out. It slides down into the pitcher. The plant then digests the insect. The Venus' flytrap is another insect-eating plant. It catches insects on its brushlike leaves. The leaves snap closed like a trap around the insect.

Why, then, are these classified as plants rather than animals? Because they are rooted to the ground. They cannot move around at will. Also, they still make food using photosynthesis. Insects just add to their diet.

✓ **Why do some plants eat insects?**

## Lesson Review

1. What four parts do all seed plants have?
2. What part of the plant makes most of its food?
3. What four things are needed for photosynthesis?
4. **CRITICAL THINKING** What job do both roots and stems do?

## Modern Leaders in Science

### PATRICIA SHANELY

Rain forests grow in very warm, wet places. They produce great amounts of oxygen. Also, rain forests provide food for a great many species of animals, including people.

In Brazil, people have cut down much of the thick plant growth in rain forests to create farmland. But rain forest soil is not good for growing crops. The crops use up the soil nutrients in a few years. Then people cut down more trees to make more fields.

For the past ten years, Patricia Shanely has studied ways to help save the rain forests. She has worked with people who live in small villages in the rain forests of Brazil. She has taught them that selling trees to lumber companies is not the only way to earn money. Many people in the villages now gather fruits from the forest trees and sell them at markets. By saving the trees, the people will be able to hunt animals for food, use oils from the trees for medicines, and eat wild fruits. The trees also will continue to provide oxygen for all of us.

**CRITICAL THINKING** What are some ways you, too, can help save the rain forests?



*Patricia Shanely works with the people of Brazil to help save the rain forests.*



## 7-2

## Plant Reproduction

## Words to Know

<b>pistil</b>	the female part of a flower
<b>egg cell</b>	a female sex cell
<b>stamen</b>	the male part of a flower
<b>pollen</b>	the light, powdery dust in stamens that contains the male sex cells
<b>sperm cell</b>	a male sex cell
<b>petal</b>	one of the colorful outer parts of a flower; it attracts insects
<b>pollination</b>	the process of transferring pollen from the stamen of a flower to the pistil of the same or a different flower
<b>fertilization</b>	the process of a sperm cell and an egg cell joining
<b>germination</b>	the process by which a tiny new plant breaks through the hard seed coat that is protecting it
<b>fruit</b>	the part of a plant that holds the seeds

## Pollination

Seed plants reproduce using female and male plant parts found in their own flowers. The **pistil** is the female part of a flower. At the bottom of the pistil is the plant's *ovary*, where the female sex cells are stored. A female sex cell is called an **egg cell**.

The **stamen** is the male part of the flower. Flowers usually have several stamens. At the end of each stamen is a light, powdery dust called **pollen**. The pollen contains the male sex cells. A male sex cell is called a **sperm cell**.

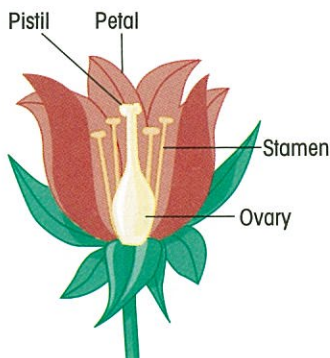


Figure 7-4 *Parts of a flower*

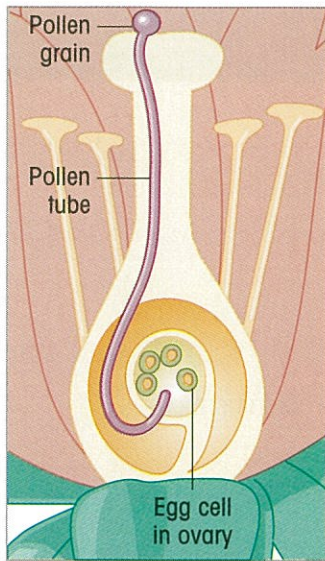


Figure 7-5 This shows the process of plant fertilization.

A flower **petal** is a colorful outer part of a flower. Flower petals attract insects. They also help to protect the inner parts of the flower.

For seed plants to reproduce, pollen must land on a pistil. Sometimes wind blows pollen off the stamens. That pollen may land on the pistil of the same plant or another plant. The pistil is sticky and traps the pollen. The entire process is called **pollination**. It is the transfer of pollen from the stamen of a flower to the pistil of another flower.

Bees often help with pollination. They are attracted to a flower because of its bright colors, pleasant smell, and its nectar. Nectar is a sweet liquid the plant produces. The bees use the nectar to make honey.

The bees have sticky legs. When they land on a stamen, the pollen sticks to their legs. They fly off. When they land on another flower, they leave a little pollen behind, on the pistil.

After pollination, a sperm cell travels down the pistil to the ovary of the flower. There it joins with an egg cell. Then a seed begins to grow. This process of sperm cell and egg cell joining is called **fertilization**.

✓ **What are the parts of a flower and how do they help in pollination?**

## Protecting the Seed

You may have eaten sunflower seeds. These come from a sunflower. Seeds are also found in apples, squashes, and many other foods.

A seed is that part of a seed plant from which a new plant can grow. A seed includes a young new plant surrounded by a hard protective coating. Most of a seed is food for the young plant. The young plant needs a lot of food for growing. When the environment is warm and wet enough, the seed grows into a plant. This may take weeks or even years.

Wind and water can carry seeds far from the plants that made them. Sometimes animals carry seeds, too. Some kinds of seeds stick to the coats of animals. An animal may carry a seed a long way before it falls off. Some seeds never make it to a good place for growing. If a seed gets a chance, however, it will grow. The tiny new plant will break through the hard seed coat that has been protecting it. This is called **germination**.

The **fruit** of a seed plant is really a container for the seed. It may be juicy. It is the plant's ovary that has grown bigger. Inside a watermelon are a lot of black seeds. All the rest of the melon is protecting those seeds from water loss, disease, and insects.

Many of the foods we call vegetables or grains are really fruits. Anything that has seeds in it but is not a cone is a fruit. This includes tomatoes, beans, avocados, eggplants, oats, and wheat. All these fruits have seeds.

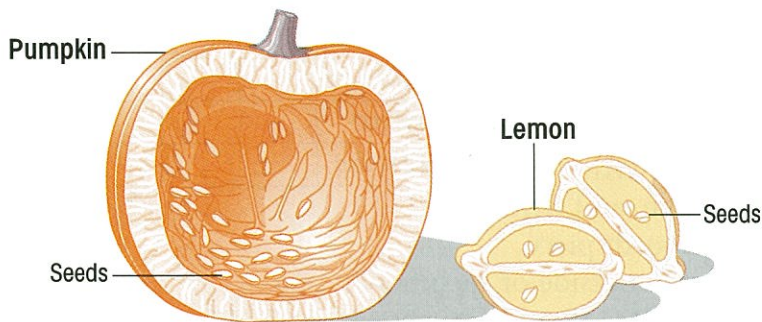


Figure 7-7 *Fruits protect their plants' seeds.*

✓ How is a seed protected?

**Lesson Review**

1. What happens when pollination takes place?
2. What happens when fertilization takes place?
3. **CRITICAL THINKING** Why do you think seeds might not germinate right away?

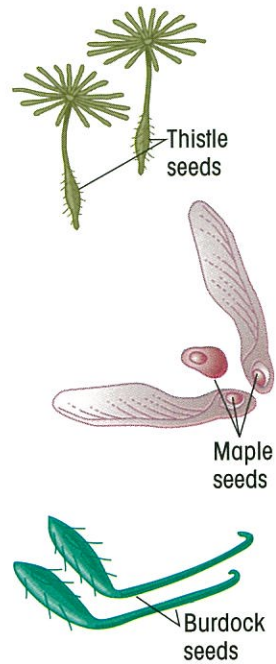


Figure 7-6 *The shape of the seed helps it to travel.*



## LAB ACTIVITY

### Germinating Seeds

#### BACKGROUND

Seeds wait for the environment to be just right before the tiny new plant starts to grow. Then the seed breaks through the hard seed coat and germination occurs.

#### PURPOSE

You will see how different conditions affect how seeds germinate.

#### MATERIALS

paper, pencil, masking tape, 4 small plastic bowls, 4 small pieces of sponge, grass or radish seeds, water, plastic wrap, refrigerator

#### WHAT TO DO

1. Copy the chart to the right.
2. Write your name on four pieces of masking tape. Write “dry and warm” on one piece of tape. Write “moist and warm” on the second piece. Write “dry and cold” on the third piece, and write “moist and cold” on the fourth piece.  
Put one piece of tape on the outside of each bowl.
3. Wet two pieces of sponge. Place them in the bowls marked “moist.”  
Put the two pieces of dry sponge in the bowls marked “dry.”
4. Sprinkle half a spoonful of seeds on each piece of sponge.  
Cover each bowl with a piece of plastic wrap.
5. Place the bowls where your teacher tells you.
6. Check the seeds every day for 5 days. Write down what you see on each sponge every day.

	Day 1	Day 2	Day 3	Day 4	Day 5
Dry and warm					
Moist and warm					
Dry and cold					
Moist and cold					

#### DRAW CONCLUSIONS

- In which dish did the seeds begin to grow first?
- Which dish contained the most new plants?
- What can you say about which conditions are best for seed germination?

## SCIENCE IN YOUR LIFE

### Products From Trees

Trees produce the oxygen we need to breathe. Trees also provide humans and other animals with foods such as apples and walnuts. But people also use wood from trees. Wood from trees that have been cut down and sawed into boards is called *lumber*. Most lumber is used in building houses and in making furniture, boxes, and crates. Bits of wood can be treated with chemicals to make *wood pulp*. Wood pulp is used to make paper. In many parts of the world, people use wood as a fuel for heating and cooking.

People also use the bark of some trees. The bark of the Pacific yew tree is used to make a medicine to fight cancer. Bottle stoppers, bulletin boards, and floor materials are made from the bark of the cork oak tree.

The liquid, called *sap*, that flows in tree trunks is also used to make products. Maple syrup is made from the sap of maple trees. Turpentine, which is used in paints and varnishes, is made from the sap of pine trees.

Make a chart like the one below.

1. Look around you for products that are made from trees. List each product.
2. Tell what part of the tree it came from.

Tree Product	Part of Tree



Logs are loaded onto a truck for their trip to a sawmill.

#### Critical Thinking

In some parts of the world, trees are being cut down for fuel faster than new trees can grow. What problems could this cause for a family in one of these areas?

**Summary**

Plants make their own food and cannot move from place to place. They have specialized parts for growth and reproduction.

**Lesson 7.1**

The roots of a plant soak up water and minerals. They also hold the plant in place. The stem holds the plant upright. It is also a pathway for food and water. Water from the roots travels up from the stem. Food made by the leaves travels down the stem. Leaves carry out most of the plant's food-making, called photosynthesis.

**Lesson 7.2**

The flower of a plant is where the seed is made. Stamens, which hold pollen, are the male parts of the flower. The pistil is the female part. Pollination takes place when pollen lands on the pistil. Seeds are young plants in a protective coating. They must be in a wet, warm place to germinate. Fruits are the ovaries of plants. They protect the seeds.

**Vocabulary Review**

Match each definition with a term from the list.

egg cell

fruit

leaf

photosynthesis

pistil

root

stamen

stem

1. The food-making part of the plant
2. The upright part of a plant that holds the plant up and carries food and water
3. The male part of a flower
4. The part of a plant that holds the seeds
5. The process that plants use to make food in the form of sugar
6. The female part of a flower
7. The part of a plant below the surface that soaks up water and minerals
8. The female sex cell in a flower

## Chapter Quiz

Write your answers on a separate sheet of paper.

1. How do plants differ from animals?
2. What four parts do all seed plants have?
3. What are three things roots do for plants?
4. What does a stem carry up a plant?
5. What does a stem carry down a plant?
6. What process in plants requires sunlight, water, chlorophyll, and carbon dioxide?
7. What happens during photosynthesis?
8. How do plants help you breathe?
9. What happens during pollination?
10. What part of a plant contains and protects the seeds?

### Test Tip

Review the diagrams and the captions in the chapter before a test. Make sure you read the labels, too.

### Research Project

Take a notebook and pencil to a grocery store. Create a chart of “Plant Parts We Eat.” Make five headings on your paper: Stems, Leaves, Roots, Seeds, Fruits. Find as many foods as you can to list under each heading. Be sure to look at the canned and frozen foods as well as the fresh foods. Research where each of these foods is grown. Include this information in your chart. Finally, plan and write a menu for a meal that includes foods from different plant parts.



*The puppies look like their mother and father. Why do you think the puppies resemble their parents?*

## Learning Objectives

- Explain how an organism passes on its traits.
- Compare dominant and recessive traits.
- Describe how DNA, genes, and chromosomes are related.
- Compare the number of chromosomes in body cells and sex cells.
- Explain the occurrence of mutation.
- Describe how the science of genetics is used in breeding.
- Give examples of how environment can affect an organism's traits.
- LAB ACTIVITY: Observe dominant and recessive traits.
- ON-THE-JOB SCIENCE: Relate an understanding of traits to cattle breeding.