

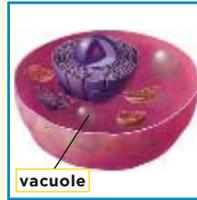
# CHAPTER 1

## Structure of Living Things

### Vocabulary



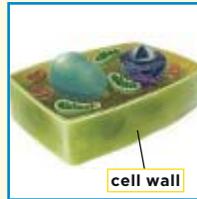
**cell** the smallest part of a living thing that can carry out processes of life



**vacuole** a cell part that holds food, water, and wastes



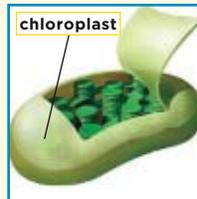
**cell membrane** a thin outer layer of a cell



**cell wall** a hard outer layer of a plant cell that protects the cell and provides support



**cytoplasm** the gel-like material inside the cell that holds all the other inner parts of the cell



**chloroplast** a part of a plant cell that uses energy from sunlight to make food



**nucleus** a large, round structure at the center of a cell that controls all the activities of a cell



**organism** an individual living thing that can carry out all its own life activities



**mitochondrion** the part of a cell that breaks down food and turns it into energy for the cell



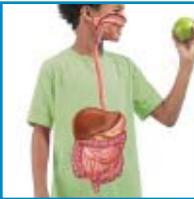
**tissue** a group of similar cells that do the same job in an organism



## What are living things made of?



**organ** a body part made of different kinds of tissues that work together to do a certain job



**organ system** a group of organs that work together to do a certain job



**kingdom** the broadest group into which living things are classified



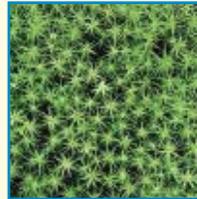
**vertebrate** an animal that has a backbone



**invertebrate** an animal that does not have a backbone



**vascular** any plant that has tubes for moving water and other materials to where they are needed



**nonvascular** any plant that soaks up water from the ground directly into its cells



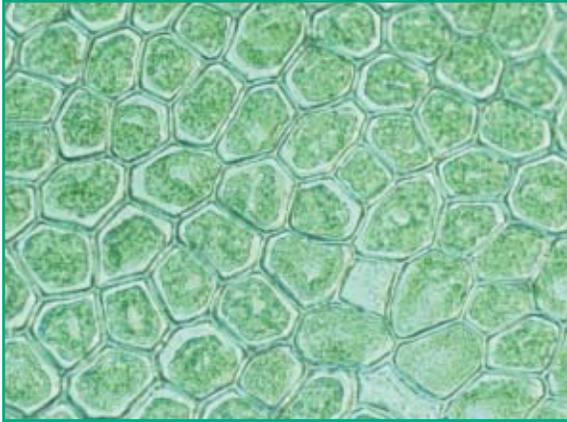
**fungus** an organism that cannot make its own food, but instead absorbs food from decaying organisms



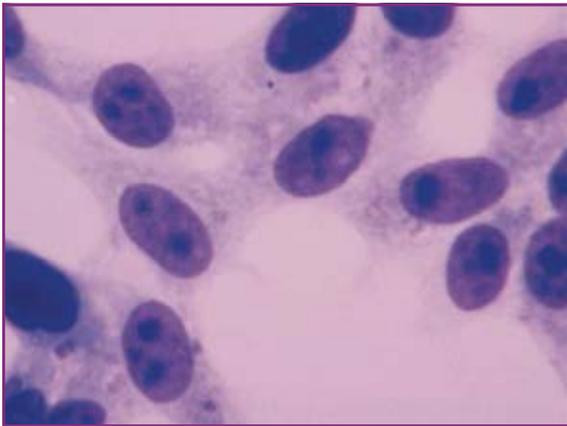
**bacteria** one-celled living things that do not have a nucleus



**protist** a one- or many-celled organism that can either make, eat, or absorb food



Plant cells often have boxlike shapes that fit closely together. This arrangement provides support for a plant.



Animal cells have more rounded shapes than plant cells. Their shapes allow for movement.

## What are plants and animals made of?

All living things are made of cells (SELZ). A **cell** is the smallest part of a living thing that can carry out life activities. That is, they take in food and grow.

Cells are the building blocks that all living things are made of. For example, your body is made of trillions of cells. A pet dog or cat is made of cells. A tree and even a blade of grass are made of cells.

There are different kinds of cells. Cells that make up plants are able to make food for a plant. They can store water. Cells that make up animals allow for taking in food, since animals do not make their own food.

### **Quick Check**

Fill in words to complete each sentence.

1. Living things \_\_\_\_\_ cells.
2. Plant cells \_\_\_\_\_ food.

# How can cells be seen?

Cells are so small that you need a microscope (MIGH•kruh•skohp) to see them. A *microscope* makes things look bigger. Cells were first

seen under a microscope over 400 years ago. It took almost 200 years of observing cells for scientists to understand that all living things are made of cells.

## Microscope Timeline



**1595**—Zacharias Janssen creates the first compound microscope.

1600

**1670s**—Dutch scientist Anton van Leeuwenhoek improves lens technology to magnify between 75 and 200 times.

1700

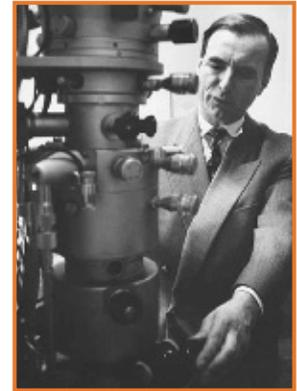
**1665**—English scientist Robert Hooke studies slices of cork, calling the tiny boxes that he sees “cells” after a Latin word that means “little rooms.”



**1860s–1890s**—Scientists develop new ways of staining cells so they are easier to see and study under a microscope.

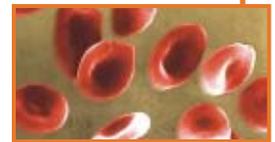
1800

**1940s**—Electron microscopes magnify 40,000 times more than previous microscopes.



1900

**1982**—Scientists build the scanning tunneling microscope that allows you to see individual blood cells.



## Reading Diagrams

Read the orange markers going from left to right on the timeline.

### Quick Check

List these people and discoveries in order from oldest to newest.

electron microscope

Janssen

scanning tunneling microscope

Hooke

3. oldest \_\_\_\_\_

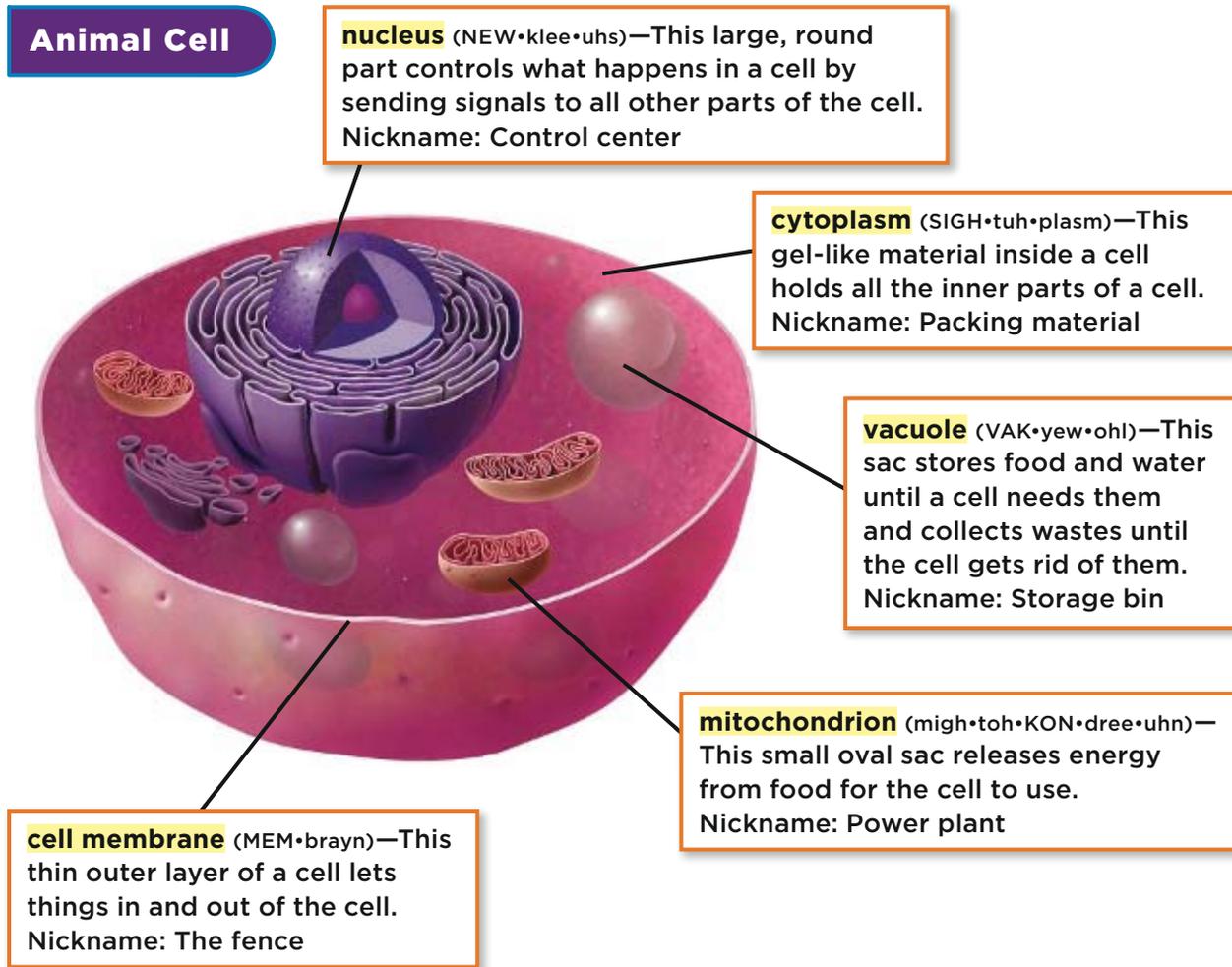
\_\_\_\_\_ newest

# What are the parts of cells?

Every cell has parts inside. Each part of a cell has a job that helps keep the cell alive.

## Animal Cells

Look inside this animal cell. Find five parts in the cell. What job does each part have?



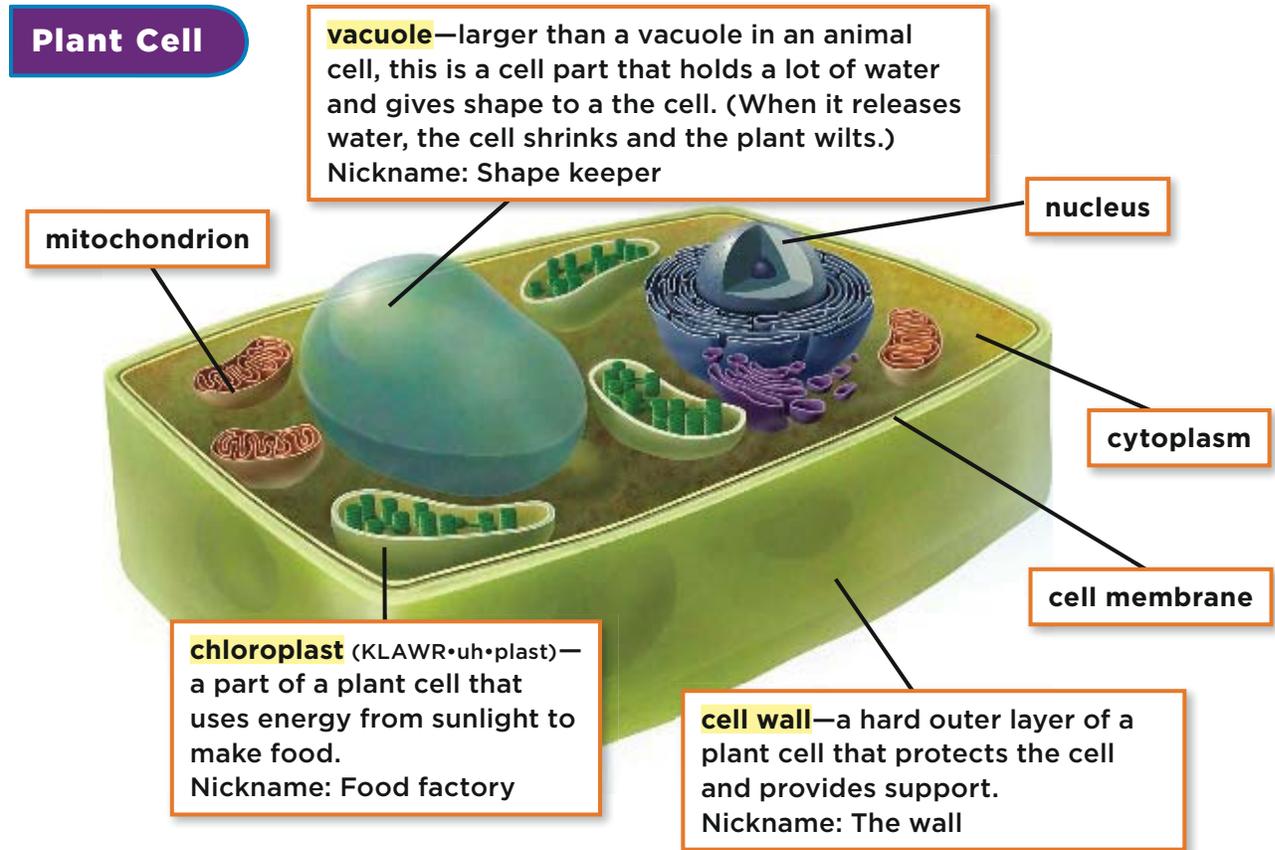
### ✓ Quick Check

Match the cell part with each statement.

- |                                 |                  |
|---------------------------------|------------------|
| 4. ___ Stores food and water.   | a. cell membrane |
| 5. ___ Lets things in and out.  | b. nucleus       |
| 6. ___ Controls cell activities | c. vacuole       |

# Plant Cells

Plants cells have the same five parts that animal cells have. However, vacuoles in plant cells are a little different from the ones in animal cells. Also, plant cells have two additional parts.



## Quick Check

Fill in the diagram with facts that explain the summary.

<p><b>7.</b> _____</p> <p>_____</p> <p>_____</p>	<p><b>8.</b> _____</p> <p>_____</p> <p>_____</p>	<p><b>9.</b> _____</p> <p>_____</p> <p>_____</p>
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**Summary:** Plant cells are different from animal cells.

## Lesson 2 From Cells to Organisms

### How are living things organized?

The word we use for any individual living thing is **organism** (AWR•guh•nizm).

An organism can carry out the basic life processes. The *life processes* are the abilities to do things that keep an organism alive and to produce more of its own kind.

#### Life Processes in Living Things

<b>Growth</b>	The ability to get bigger
<b>Response</b>	The ability to react to changes in the surroundings
<b>Reproduction</b>	The ability to produce offspring—that is, more of its own kind
<b>Nutrition</b>	The ability to take in food or raw materials to support the other life processes
<b>Respiration</b>	The ability to release energy from inside the food
<b>Excretion</b>	The ability to get rid of waste

#### Reading Charts

In each row, the word in heavy print at the left is the name of a life process. The words to the right describe the life process.

#### **Quick Check**

Two abilities that an organism has are:

10. \_\_\_\_\_

11. \_\_\_\_\_

## Kinds of Organisms

Remember, cells are the smallest part of a living thing. So, cells are the smallest part of an organism. Based on the number of cells, there are two kinds of organisms:

- **one-celled organisms** A one-celled organism carries out all its life processes in a single cell. One-celled organisms live in water, soil, and even on dust in the air.
- **many-celled organisms** People and all animals and plants are many-celled organisms. In a many-celled organism, each cell carries on life processes. However, the cells work together to do different jobs. For example, muscle cells in your heart work to keep your heart beating.



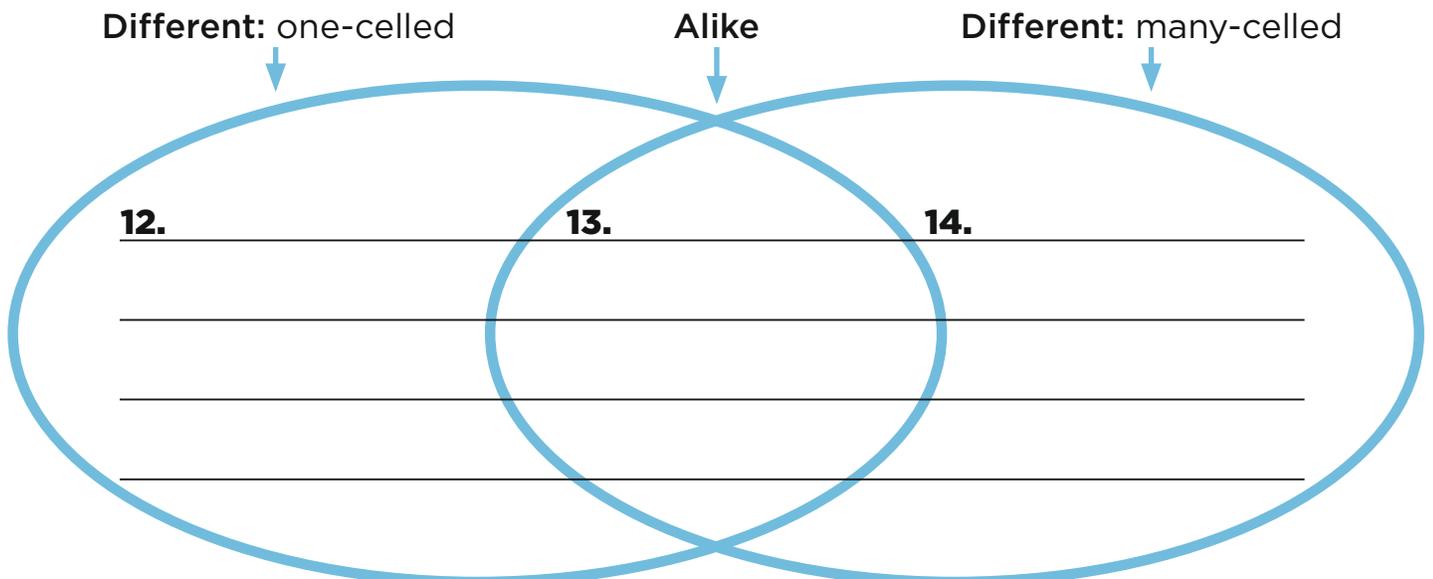
Diatoms are one-celled organisms. They are found in fresh water and salt water. You need a microscope to see them.



All plants and all animals, such as this mountain lion cub are many-celled organisms.

### Quick Check

How are one-celled and many-celled organisms alike and different?

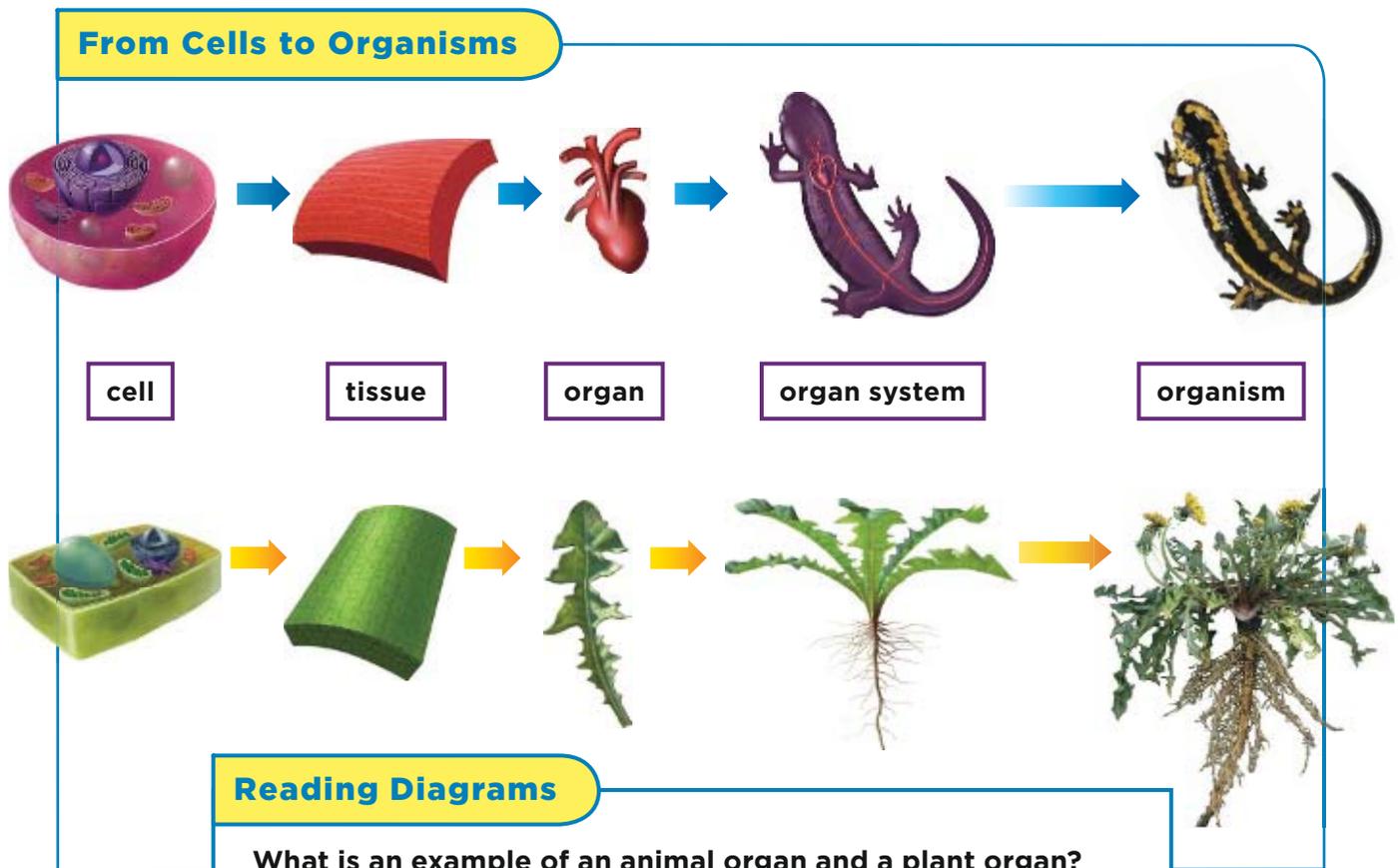


# How do cells work together?

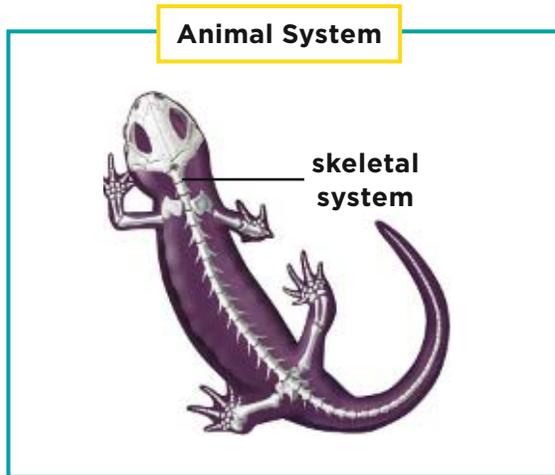
Many celled organisms are made of different kinds of cells—such as blood cells, muscle cells, nerve cells, and so on. Each of these kinds of cells has a particular job.

Cells of the same kind work together doing their particular job. A group of the same kind of cells that do the same job is called a **tissue** (TISH•ew). Examples include:

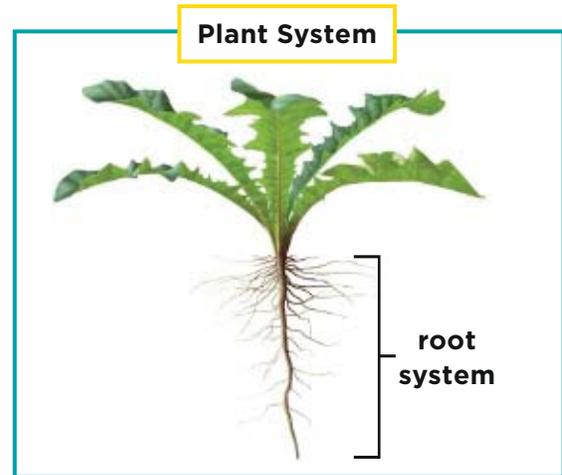
- **animals** muscle tissue (which allows you to move), blood, nerves, bone, and skin
- **plants** tissue that carries water from roots to stems to leaves, flesh of fruits.



*Science in Motion* Watch how multicellular living things are organized to form organisms @ [www.macmillanmh.com](http://www.macmillanmh.com)



The skeletal system is a support and movement system.



The root system is a transport system.

## Organs and Organ Systems

Tissues of different kinds come together to make up an **organ** (AWR•guhñ). Examples are:

- **animals** brain, lungs, heart, stomach
- **plants** stems, fruits

A group of different organs that work together to do a certain job is an **organ system** (AWR•guhñ). Examples are:

- **animals** system for breaking down food, transporting system, skeletal system
- **plants** root system, shoot system (stems and leaves)

### **Quick Check**

Write the letter of the meaning of each

- |   |   |
|---|---|
| <p><b>15.</b> ___ tissue</p> <p><b>16.</b> ___ organ</p> <p><b>17.</b> ___ organ system</p> | <p><b>a.</b> a group of organs working together</p> <p><b>b.</b> many of the same cells working together</p> <p><b>c.</b> a group of tissues working together</p> |
|---|---|

## How are living things grouped together?

There are millions of kinds of living things on Earth. To show how living things are alike, scientists classify them. *Classifying* means “putting into groups” based on how alike the living things are.

One way scientists classify living things is to put them into six kingdoms. A **kingdom** is the broadest group into which living things are classified.

Members of the same kingdom are then divided into smaller and smaller groups. The smaller the group, the more alike its members are.

- a kingdom is divided into phyla (*singular*, phylum).
- a phylum is divided into classes
- a class is divided into orders
- an order is divided into families
- a family is divided into genera (*singular*, genus)
- a genus is divided into species



The scientific name of a horse is *Equus caballus*, from its genus (*Equus*) and species (*caballus*).

### Quick Check

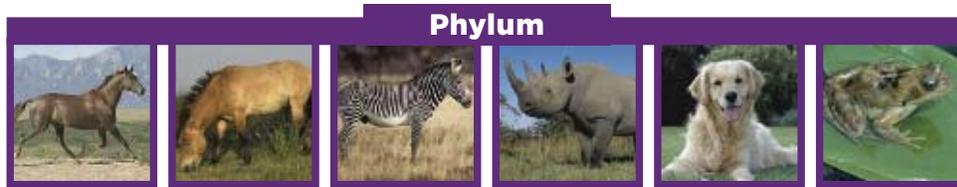
In each row, cross out one word that is out of order.

18. kingdom phylum order class

19. order family species genus

## Classification of Horses

Start with the seven animals in the top row. As you go to each row below it, the one animal that is least like the others is removed.



**Quick Check**

Tell which animal was removed when you go

**20.** from Kingdom to phylum

\_\_\_\_\_

**21.** from phylum to class

\_\_\_\_\_

**22.** from class to order

\_\_\_\_\_

# What do animals have in common?

All animals belong to one kingdom, the Animal Kingdom. How are all animals like?

- All animals are many-celled living things.
- All animals get energy from eating other living things.

There are so many different kinds of animals that scientists divide them into many phyla (that is, smaller groups). Many of the phyla are made up of invertebrates (in•VUR•tuh•brayts). An **invertebrate** is an animal that does not have a backbone. The table lists phyla that are made up of invertebrates.

<b>Animal Kingdom: Phyla Without Backbones</b>	
<b>Phylum</b>	<b>Examples</b>
Sponges	glass sponges
Cnidarians	jellyfish, corals
Flatworms	planarians, tapeworms
Roundworms	hook worm, vinegar eel
Mollusks	clams, oysters, squids, snails
Segmented worms	earthworms
Arthropods	insects, spiders, lobsters, crayfish, millipedes, centipedes
Echinoderms	sea stars, sand dollars, sea cucumbers, sea urchins



The body of a sponge is a hollow tube with small holes. Sponges trap food that is carried into their bodies by water.



Arthropods have a hard outer skeleton and jointed legs (legs that can bend where parts are connected). Their bodies are in sections. A spider has 2 body sections and 8 jointed legs.

## Phylum Chordata

Animals we are most familiar with—such as frogs, dogs, cats, and horses—belong to another phylum, *Chordata* (KAWR•day•ta). Members of this phylum have a supporting rod that runs the length of their body for at least part of their life.

This phylum includes some unusual water-dwellers such

as sea squirts. Sea squirts are invertebrates. However, most members of this phylum are vertebrates (VUR•tuh•braytz). A **vertebrate** is an animal that has a backbone.

This phylum is divided into many classes. Here are the classes that are made up of vertebrates.

### Animal Kingdom: Phylum Chordata Classes with Backbones

Class	Examples
Jawless fish	lampreys
Cartilage fish	sharks, rays, skates
Bony fish	most familiar fish of sea and fresh water
Amphibians	frogs, salamanders, toads
Reptiles	snakes, lizards, turtles, alligators
Birds	ducks, chickens, robins, ostriches, penguins
Mammals	dogs, cats, squirrels, horses, tigers, lions, humans



Fish live in water. They have gills for taking in oxygen from water. Most familiar fish are bony fish—they have skeletons and jaws.



A cow is a mammal. Mammals have hair or fur and young are fed from their mother's milk.

### Quick Check

Cross out the animal that does not belong in each row.

23. frogs birds clams fish horses

24. sponges earthworms sea stars spiders sharks

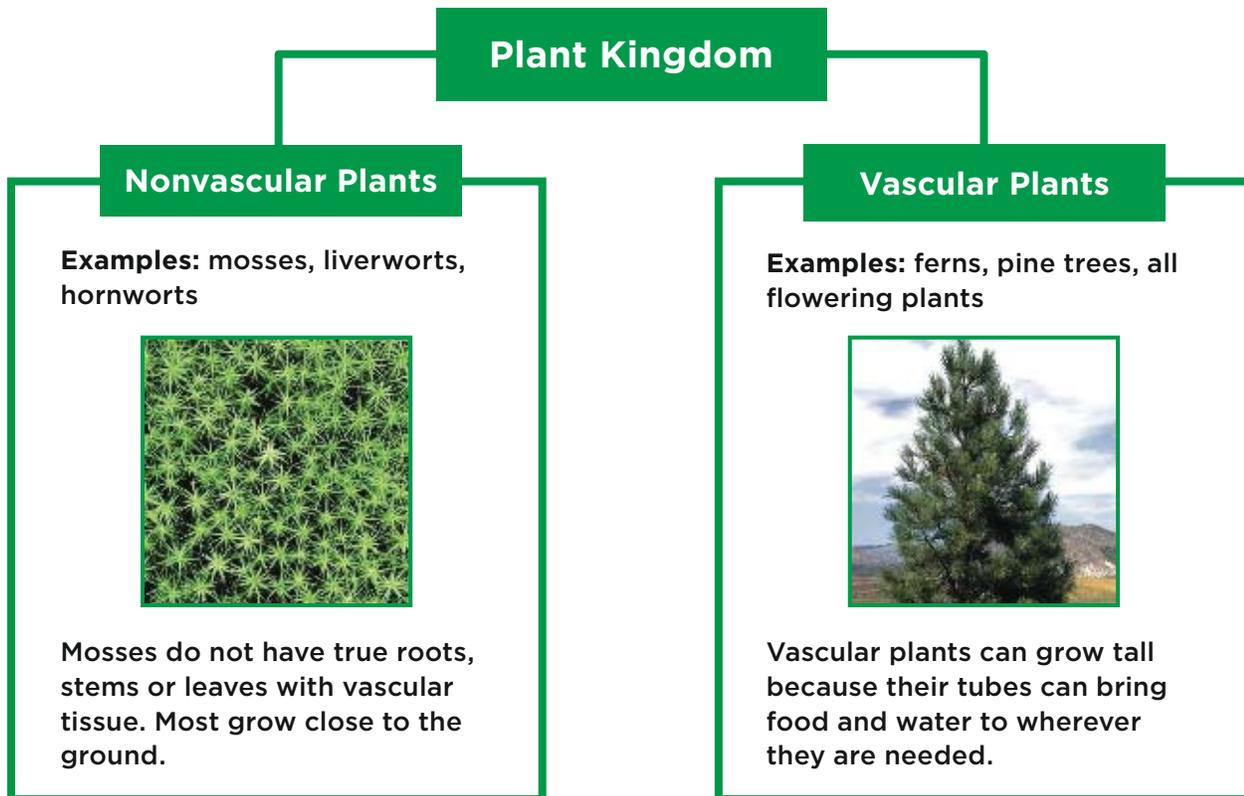
# What are plants?

All plants are many celled living things. They can all produce their own food.

Most common plants are vascular (VAS•kyuh•luhr) plants. **Vascular** plants have tubes running up and down inside. The tubes bring water and minerals from the ground up to roots and stems into the leaves. They bring food from

the leaves to other parts of the plant.

On the other hand, mosses are nonvascular (non•VAS•kyuh•luhr) plants. **Nonvascular** plants do not have tubes for moving water and other materials. They soak up water directly from the soil into their cells. To do so, they must grow very close to the ground.



## Quick Check

25. All plants are alike because they can \_\_\_\_\_.

26. Mosses are not like pine trees because mosses do not have

\_\_\_\_\_.

## What are fungi?

Mushrooms often grow from the ground. So people often mistake them for plants. However, a mushroom is not a plant. It is a fungus (FUNG•guhs). A **fungus** cannot make its own food, as plants can. A fungus absorbs food from dead organisms in their surroundings. Fungi (FUN•ji), which means more than one fungus, can be one celled or many celled. They can be helpful or harmful.

Helpful Fungi	Harmful Fungi
<ul style="list-style-type: none"><li>• Some break down dead organisms into materials that enrich soil</li></ul>	<ul style="list-style-type: none"><li>• Wild mushrooms can be poisonous.</li></ul>
<ul style="list-style-type: none"><li>• Yeasts can make bread rise.</li></ul>	<ul style="list-style-type: none"><li>• Some cause disease, such as athlete's foot.</li></ul>
<ul style="list-style-type: none"><li>• Some are used in medicines, such as this mold, which produces penicillin.</li></ul> 	<ul style="list-style-type: none"><li>• Some attack crops, such as wheat rust and this corn smut.</li></ul> 

### Quick Check

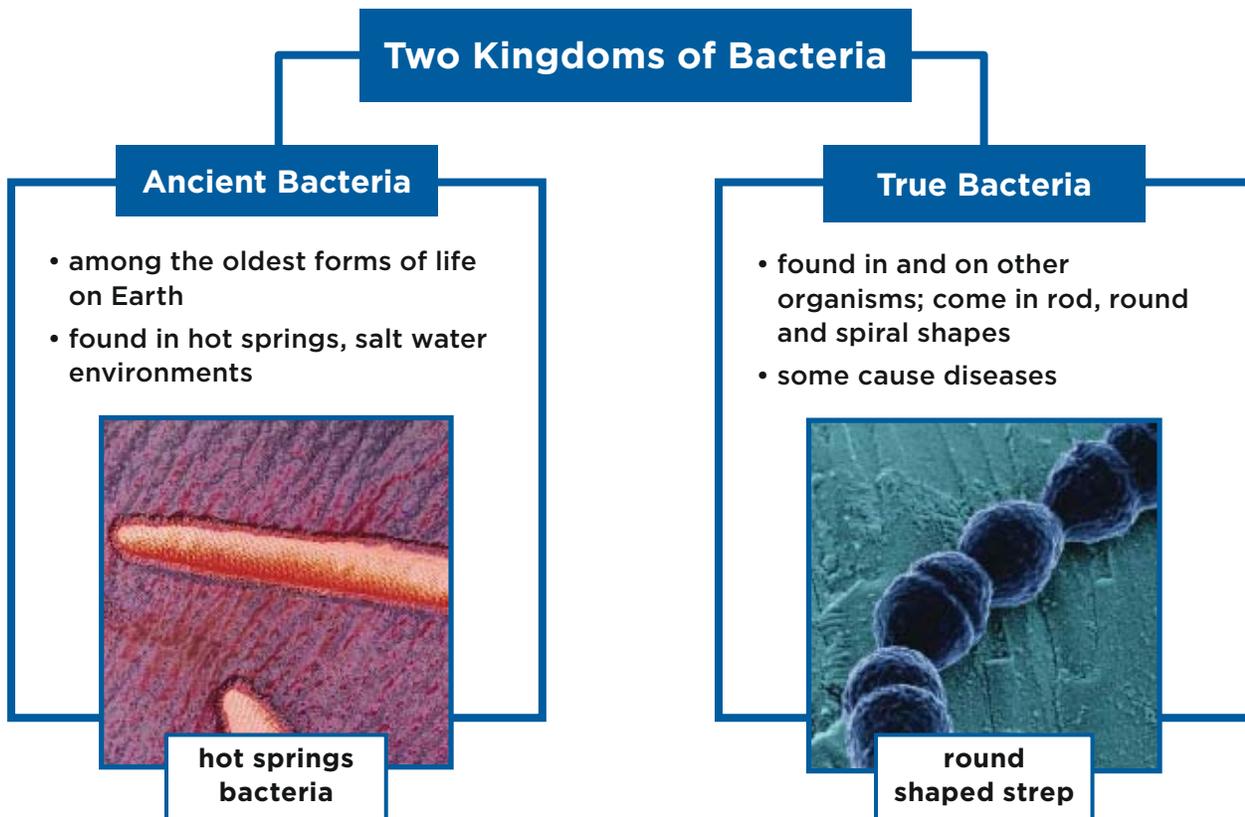
**27.** One way a fungus is different from a plant is that a fungus

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# What are bacteria?

**Bacteria** (bak•TEER•ee•uh) are one-celled living things. Remember that cells have a part called a nucleus, the cell control center. Bacteria do not have a nucleus. They do have other parts, such as a cell membrane and cytoplasm. Most have cell walls.

Bacteria make up two kingdoms. True bacteria may cause diseases. However, many are helpful such as bacteria in your digestive system that help you digest food. Bacteria are used to produce yogurt and other foods.



## **Quick Check**

**28.** Bacteria are not like other cells because bacteria

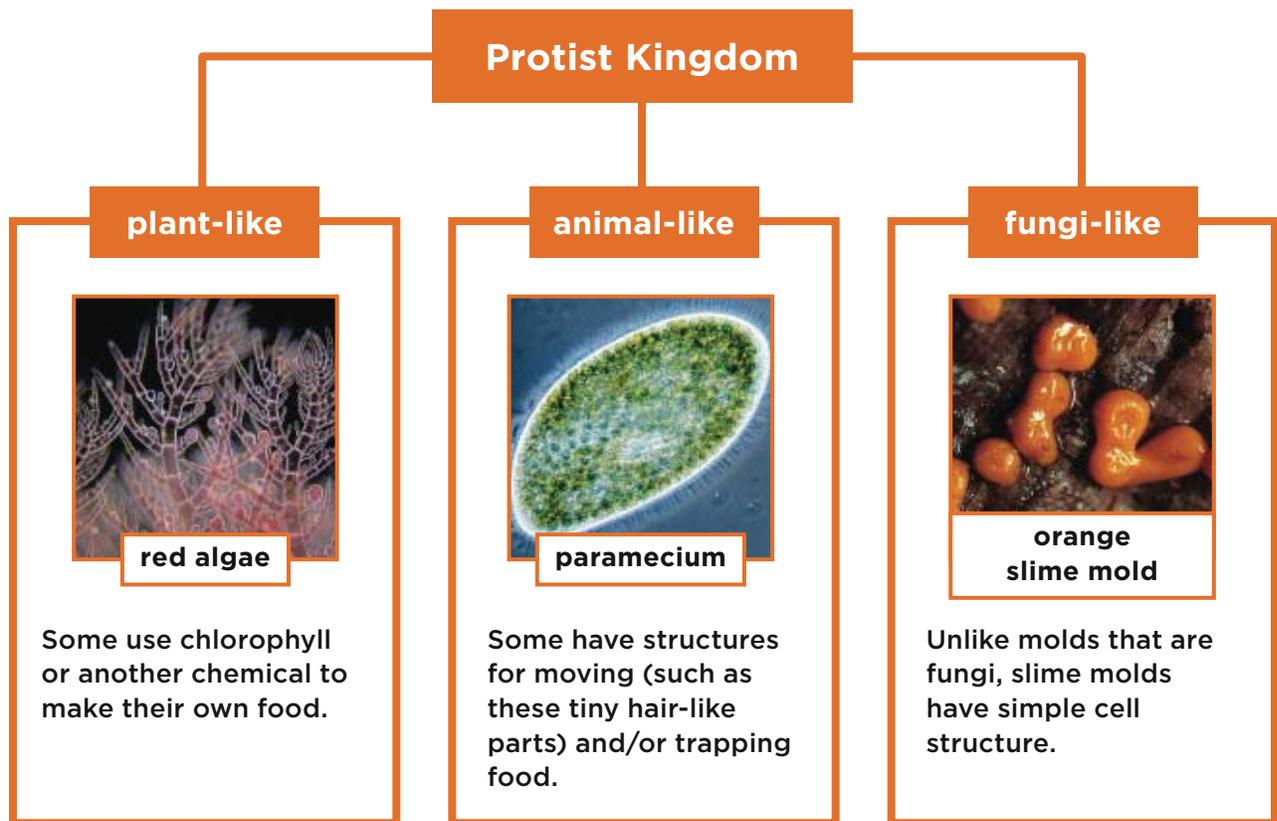
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# What are protists?

**Protists** (PRO•tists) are living things that do not fit any other kingdom. They may be one celled or many celled. Also:

- some make their own food, like plants
- some eat other living things, like animals
- some break down dead organisms, like fungi

However, they are much simpler than plants, animals, and fungi.



## ✓ Quick Check

List one thing that each protest can do

29. plant-like protists \_\_\_\_\_

30. animal-like protists \_\_\_\_\_