HOUGHTON MIFFLIN

# California Science

# Study Guide

Lesson Main Idea Worksheets

Lesson Science Vocabulary Worksheets

Lesson Support Vocabulary Worksheets

HOUGHTON MIFFLIN BOSTON

## IMPORTANT NOTICE
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# Contents

## Unit D Elements and Their Combinations

# To the Teacher

Use this *Study Guide* with each lesson of *Houghton Mifflin Science, California Edition.* This *Study Guide* provides a variety of activities that help students check their understanding of each lesson's main idea and practice using the lesson's vocabulary.

### *Main Idea*

Main Idea pages provide reinforcement for the core lesson content. A main idea statement is followed by three or four sentences that tell the details of the lesson's main idea. These details outline the main idea providing scaffolding for students as they complete the interactive activities and strengthen their understanding of key lesson content. These activities may also be used to review and prepare for tests.

### *Science Vocabulary*

The Science Vocabulary page of each lesson reinforces key science vocabulary words while helping students access lesson content. The key science vocabulary words are listed on the first Learn by Reading page of each lesson in the student's textbook. All of the key vocabulary words in a lesson are covered in interactive activities designed to offer meaningful practice using these science words.

### *Support Vocabulary*

The words found on the Support Vocabulary page have high general utility across the curriculum. These words are important to understanding the content of the lesson, but are not defined in the text. A glossary appears on the page for reference as students complete the activities. The Support Vocabulary page gives all students a way to work with everyday words that provide meaning for science concepts.

***Homework** activities allow students an opportunity to demonstrate their understanding of the important concepts and key science vocabulary in each chapter.*

***Vocabulary Skill** practice addresses the Vocabulary Skill presented in the Vocabulary Preview of each chapter as well as other grade-level vocabulary skills.*

Name _____ Date _____



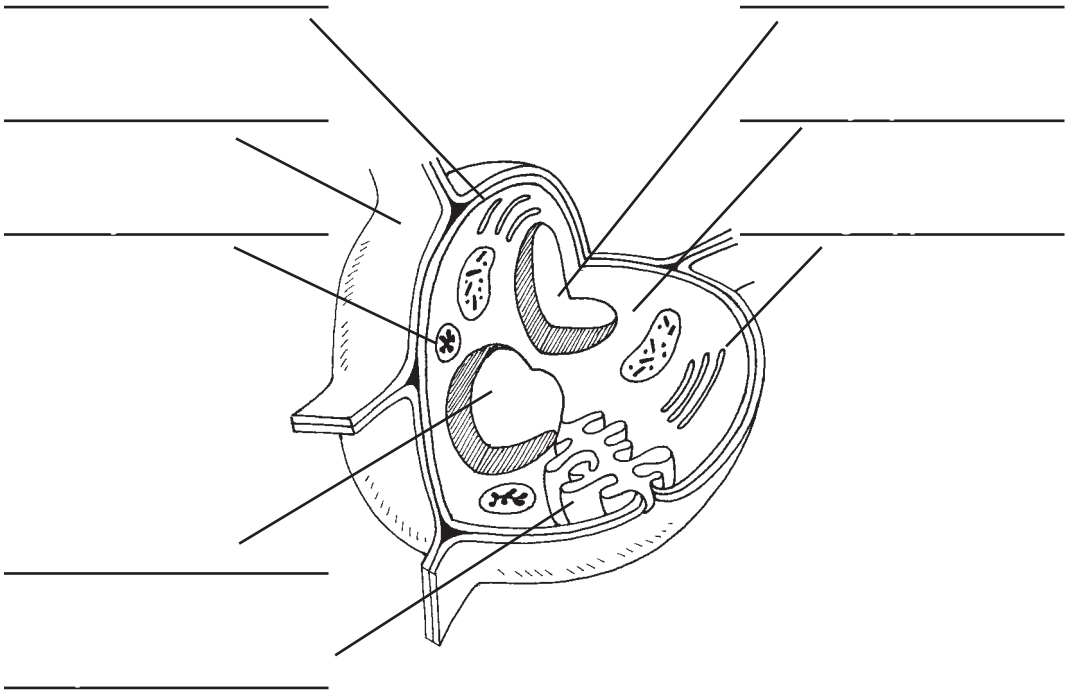
# What Are the Parts of a Cell?

**Main Idea** Cells are the basic building blocks of living things. Cells contain special structures to transport cell materials.

- All living things are made of cells. Cells are the basic unit of all living things. All cells come from other cells.
- All living things depend on cells to carry out the basic functions of life.
- Cells are made up of organelles that perform specific functions.

**A. Use the words from the box to complete the diagram of a plant cell.**

| | | | |
|---|---|---|---|
| cell membrane | cell wall | cytoplasm | endoplasmic reticulum |
| lysosome | nucleus | Golgi apparatus | vacuole |



Name _____ Date _____



# What Are the Parts of a Cell?

**B. Complete the sentences comparing the similarities and differences between plant and animal cells.**

1. Plant cells make their own food, but animals take in their food by _____.
2. While the cells of both plants and animals are surrounded by a thin, flexible _____, only plant cells have a _____, a rigid outer layer for protection and support.
3. Both plant cells and animal cells store water, food, and waste in _____; animal cells may have _____ vacuoles, while plant cells often have _____ vacuole.
4. _____ help cells break down nutrients and old cell parts and are common in _____ cells but rare in _____ cells.
5. _____, containing pigments that absorb sunlight, are found in _____ cells but not in _____ cells.

**C. Add a word to each group. Then write a sentence that describes the group.**

lysosomes, vacuoles, _____

_____

energy, support, _____

_____

bacteria, yeast, _____

_____

_____

Name _____ Date _____



# What Are the Parts of a Cell?

| | |
|---|---|
| cell | cytoplasm |
| nucleus | organelle |

**Match the words from the box to each description. The words will be used more than once.**

_____ the basic unit of a living organism

_____ a small structure in cells that performs a specific function

_____ comes from another cell

_____ directs the activities of a cell

_____ thick fluid between the nucleus and the cell membrane

_____ carries out the functions of life

_____ surrounds lysosomes, vacuoles, and other cell parts

_____ stores DNA

_____ can make a copy of itself

_____ a ribosome is one of these

**Homework:** A mnemonic is a device such as a pattern of letters, words, or ideas that assists in remembering something. For example: Chloroplasts are filled with chlorophyll. Create a mnemonic to help you remember the name and function of a cell part or an organelle.

Name _____ Date _____



# What Are the Parts of a Cell?

## Glossary

| | |
|---|---|
| **conclusion** | decision or opinion reached by reasoning |
| **function** | proper work, normal action or use |
| **membrane** | a thin soft layer of tissue that lines or covers something |
| **organism** | a living thing formed of separate parts that work together to carry on the various processes of life |
| **pigment** | substance that occurs in and colors the tissues of a living thing |
| **proteins** | complex chemical compounds that make up the parts of cells and allow the cell to perform chemical reactions |

**Complete each sentence to tell about cells.**

1. Cells are the building blocks of every living _____.
2. Every organelle has a specific _____.
3. The Golgi apparatus receives and processes _____.
4. The _____ chlorophyll gives plants their green color.
5. Food, water, and gases enter cells through the cell _____.
6. In the late 1800s, scientists made a _____ that cells come from other cells.

**Vocabulary Skill: Word Parts**

In the word *multicellular*, the prefix *multi-* means "many," and the suffix *-ular* indicates the word is an adjective. Based on this information, write a definition for the word.

_____

_____

Name _____ Date _____



# How Do Cells Make and Use Energy?

**Main Idea** To get energy, plant and animal cells break down sugar, releasing water and carbon dioxide.

- All living things require energy to survive.
- Cells break down glucose and capture its energy in a process called cellular respiration.
- Cells need energy to move, make proteins, divide, and transport materials.

**A. Complete the sentences to tell how cells use energy.**

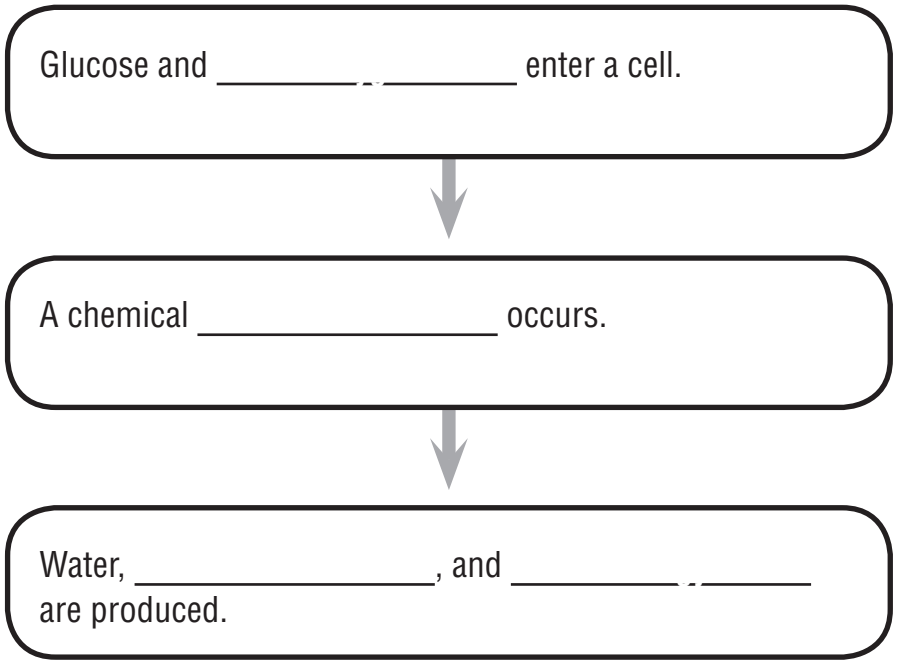
1. Plants get energy from food they make for themselves. Animals get energy from _____ _____.
2. In order to acquire glucose, some animals eat plants. Other animals eat _____ _____.
3. Energy for a flashlight is stored in a battery. Energy for a cell is stored in _____.
4. Animals are able to store glucose. However, animals cannot store _____ _ _____.
5. When animals breathe in, they inhale oxygen, which is required for cellular respiration. When animals breathe out, they exhale _____, which is _____ _____ _____.
6. Some proteins allow cells to control the chemical reactions inside. Other proteins provide _____ _ _____ _____ _____.
7. In passive transport, materials move from areas of high concentration to areas of low concentration. In active transport, _____ _____ _____.

Name _____ Date _____



# How Do Cells Make and Use Energy?

**B. Complete the diagram to describe cellular respiration.**




**C. Rewrite each sentence about energy to make it true.**

**1.** Two factors that determine how much energy an animal needs are whether it has fur and how much it sleeps each day.

_____

_____

**2.** Plants require less energy than animals because they are much smaller than most animals.

_____

_____

**3.** Plants use energy to carry out cellular respiration.

_____

_____

Name _____ Date _____



# How Do Cells Make and Use Energy?

| cellular respiration | diffusion | osmosis |
|---|---|---|

**Match the words from the box to each description. The words may be used more than once.**

_____ _____ cells break down glucose in this process

_____ works to keep water inside cells

_____ the process that spreads substances through a gas or liquid

_____ _____ serves to change glucose and oxygen into carbon dioxide gas and water

_____ spreads materials into and out of cells

_____ takes place across a membrane that lets water pass, but keeps out many things that are dissolved in the water

**Homework:** Draw a cartoon illustrating the concepts of active transport and passive transport. For example, the cartoon could be of people crowding onto a subway car (active transport) and people exiting a subway car (passive transport). Be sure to label your drawing.

# How Do Cells Make and Use Energy?

## Glossary

| | |
|---|---|
| **division** | condition of being separated into equal parts |
| **propeller** | a wheel with curved blades |
| **reactions** | processes in which substances act on each other |
| **structure** | the arrangement of parts and elements |
| **transport** | process of carrying from one place to another |

**Use the words from the box to complete the paragraph about why cells need energy.**

Cells need energy to perform important life functions. First, all cells make and use proteins. Some proteins allow cells to control chemical _____. Other proteins provide _____ and support for organisms. Cells also need energy to create movement. For example, some single-celled organisms use a structure that acts as a _____. Cell _____, which allows an organism to grow, also requires energy. Finally, the _____ of materials across a cell membrane requires energy.

**Vocabulary Skill: Word Parts**

The word *transport* consists of the prefix *trans-*, which means "across," and the root *port*, which means "to carry." Write your own definition of *transport* based on this information.

_____

Name _____ Date _____



# How Are Cells Organized?

**Main Idea** Cells join together to perform basic life functions in multicellular organisms.

- Tissues are made up of specialized cells of the same type.
- Organs are made up of tissues that perform specific functions.
- Organisms are made up of organ systems that perform specific functions.

**A. Complete the chart to tell about the specialization of cells.**

| Type of Cell | Characteristics | Functions |
|---|---|---|
| skin | _____ _____ | form a protective layer around the body |
| _____ | long with many branches | _____ _____ |
| _____ | _____ _____ | cause movement |

**B. Complete each sentence to tell about organ systems.**

**1.** The _____ _____ _____ breaks down food into _____ that cells can absorb.

**2.** The _____ _____ __ _____ brings oxygen to the body and _____.

**3.** The circulatory system brings _____ _ _____ and _____ to body cells and removes _____.

Name _____ Date _____



# How Are Cells Organized?

**C. Add the descriptions to the chart to tell how cells are organized.**

the basic building blocks of living things
a living thing made up of a combination of organ systems
a group of related organs that work together
a group of related tissues that perform a specialized function
a large group of similar specialized cells

Cells: _____

_____

↓

Tissues: _____

_____

↓

Organs: _____

_____

↓

Organ Systems: _____

_____

↓

Organism: _____

_____

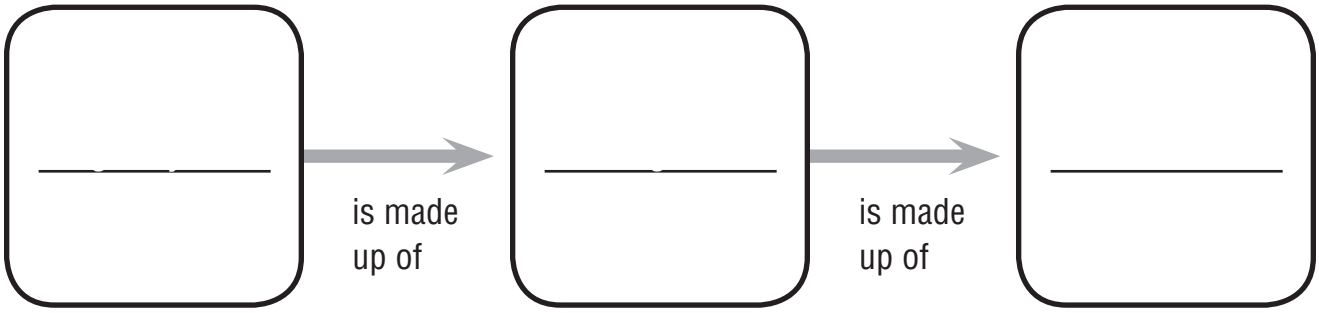
Name _____ Date _____



# How Are Cells Organized?

organ  organ system  tissue

**A. Use the words from the box to complete the diagram about cellular organization.**




**B. List four examples of cell organization in each of the following categories.**

| Tissues | Organs | Organ Systems |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

**Homework:** Choose an organ system that you would like to learn more about. Use the library or the Internet to research your choice, and then write a summary of what you learned.

Name _____ Date _____

# How Are Cells Organized?

## Glossary

| | |
|---|---|
| **absorb** | to take in and make part of itself |
| **complex** | made up of a number of parts |
| **contract** | to draw together, make shorter |
| **expel** | to force or drive out |
| **relax** | to loosen up, become less stiff |
| **simple** | made up of one part |
| **specialize** | to perform a specific function |

**Use the words from the box to complete the sentences to tell about cellular organization.**

1. Single-cell organisms have a _____ _____ structure compared to the _____ _____ structure of a multicellular organism.
2. Cells _____ _____ in their functions.
3. Arm muscles _____ to pick up an object and _____ to put it down.
4. Cells _____ nutrients and _____ _____ wastes.

**Vocabulary Skill: Antonyms**

Antonyms are words that have opposite meanings. Identify the pair of antonyms in the box.

_____

Name _____ Date _____



# How Do Plants Produce Food?

**Main Idea** Plants use energy from the Sun to make food. They combine carbon dioxide and water to make sugar, and release oxygen in the process.

- During photosynthesis, plants make their own food using energy from the Sun.
- Photosynthesis occurs in the chloroplasts of the leaves of plants. Chlorophyll is the pigment in chloroplasts that absorbs light.
- Plants remove carbon dioxide from the air and add oxygen and water vapor.

**A. Complete the diagram to tell about the process of photosynthesis.**

_____ takes place in organelles called chloroplasts located in a plant's leaves.

↓

Inside the chloroplasts, a pigment called _____ absorbs light.

↓

During photosynthesis, the Sun's energy is used to split _____ molecules into hydrogen and oxygen.

↓

The hydrogen then joins with carbon from carbon dioxide to form _____.

↓

The plant releases _____ gas and water vapor into the atmosphere.

Name _____ Date _____



# How Do Plants Produce Food?

**B. Rewrite each statement about photosynthesis to make it true.**

**1.** Photosynthesis occurs in the roots of plants.

_____

**2.** Carbon dioxide enters a leaf through its veins.

_____

**3.** Chloroplasts use the energy of sunlight and oxygen to make glucose.

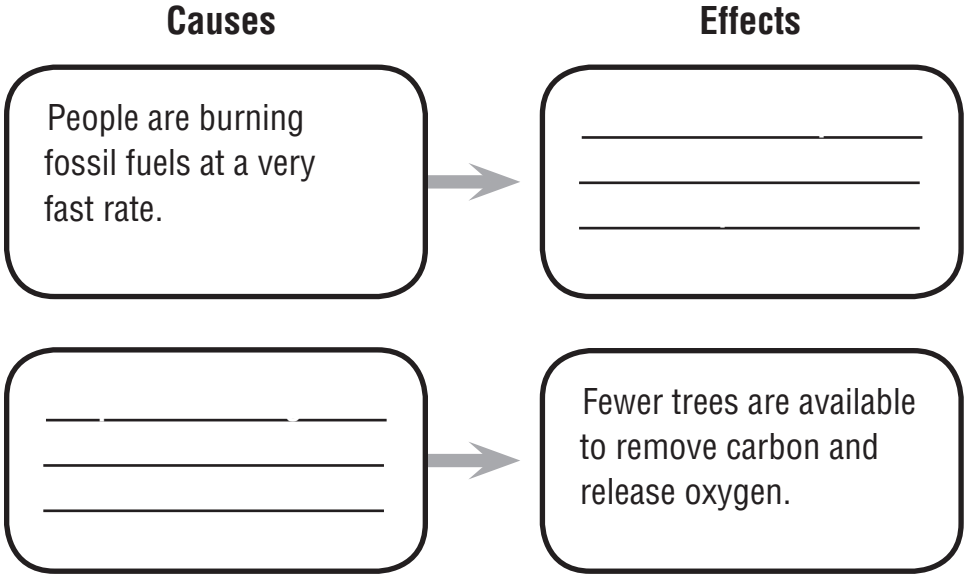
_____

_____

**4.** Photosynthesis produces carbon dioxide and glucose.

_____

**C. Complete the diagram to tell about the effects of human activities on the cycles of carbon and oxygen.**



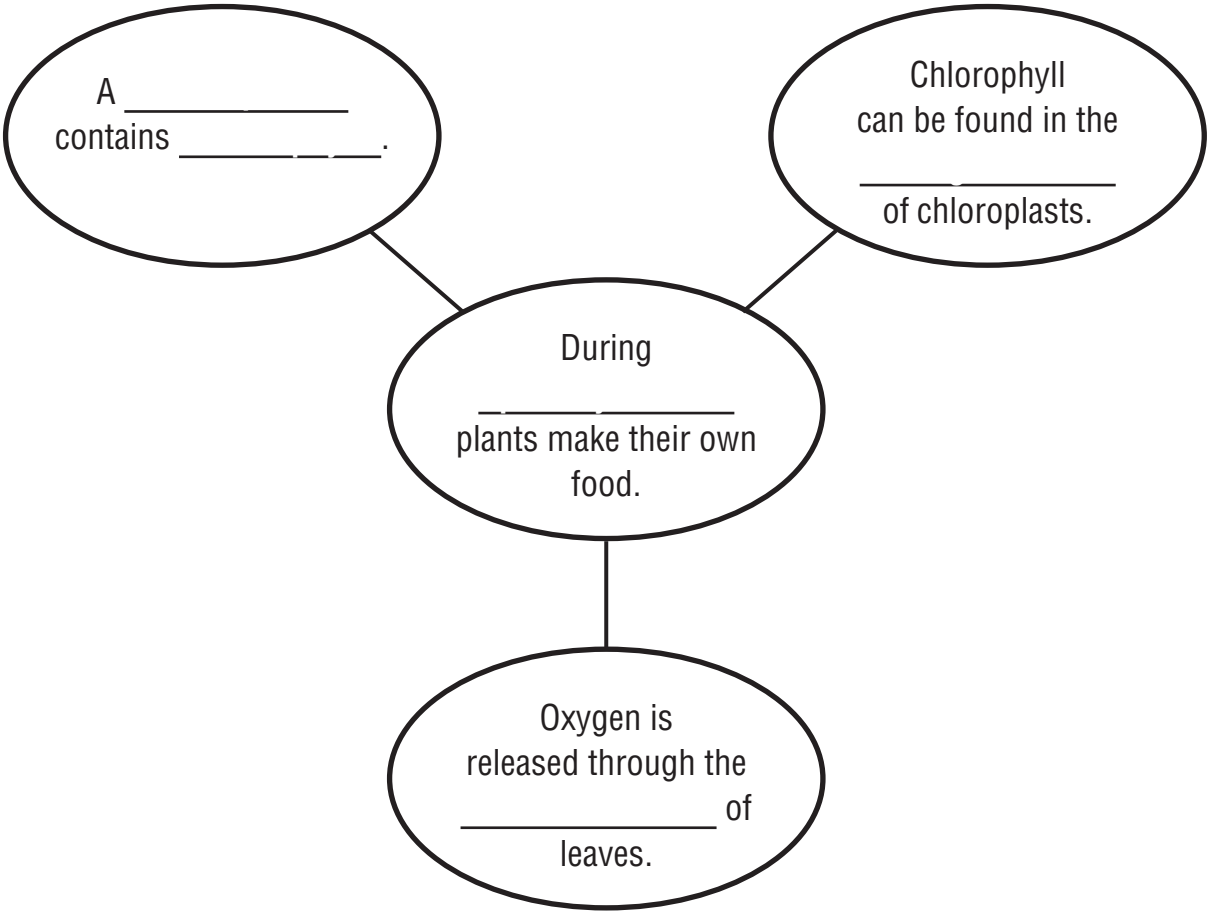
Name _____ Date _____



# How Do Plants Produce Food?

| | | |
|---|---|---|
| chlorophyll | grana | stomata |
| chloroplast | photosynthesis | |

**Complete the diagram with words from the box to tell about the process of photosynthesis.**




**Vocabulary Skill:**
**Prefixes**

The prefix *chloro-* indicates the color green. What part of a tree is responsible for making its leaves green?

_____

Name _____ Date _____

# How Do Plants Produce Food?

## Glossary

| | |
|---|---|
| **blade** | the flat, wide part of a leaf |
| **compound** | having more than one part |
| **epidermis** | a skinlike layer of cells in plants |
| **simple** | not divided into parts, single |
| **veins** | vessels forming the framework of a leaf |

**Use the words from the box to complete the sentences about the structure of leaves.**

1. The broad, flat portion of the leaf is called the _____.
2. A _____ _____ leaf has a blade that is one piece.
3. A _____ _____ leaf has a blade that is divided into parts.
4. The outer layer of a leaf is called the _____ _____.
5. _____ carry materials in and out of the leaf, connecting the leaf's cells to the rest of the plant.

**Homework:** Draw a diagram of the process of photosynthesis. Be sure to show what is needed for the process to occur and what results. Then write a paragraph that explains the process shown in your diagram.

Name _____ Date _____



# How Do Plants Move Materials?

**Main Idea** Plants have specialized tissues and use natural forces to transport water, minerals, and nutrients.

- In nonvascular plants, materials move from cell to cell through diffusion.
- In vascular plants, specialized tissues transport materials.
- Water moves up in vascular plants through the xylem because of cohesion, root pressure, and transpiration. Gravity moves sugar down through the phloem.

**A. Write *vascular* by each example or characteristic of a vascular plant. Write *nonvascular* by each example or characteristic of a nonvascular plant.**

_____ sunflower

_____ mosses

_____ absorb water and minerals through roots

_____ grow well with little light

_____ redwood

_____ roots, stems, and leaves

_____ liverworts

_____ veins

_____ no leaves, stems, or roots

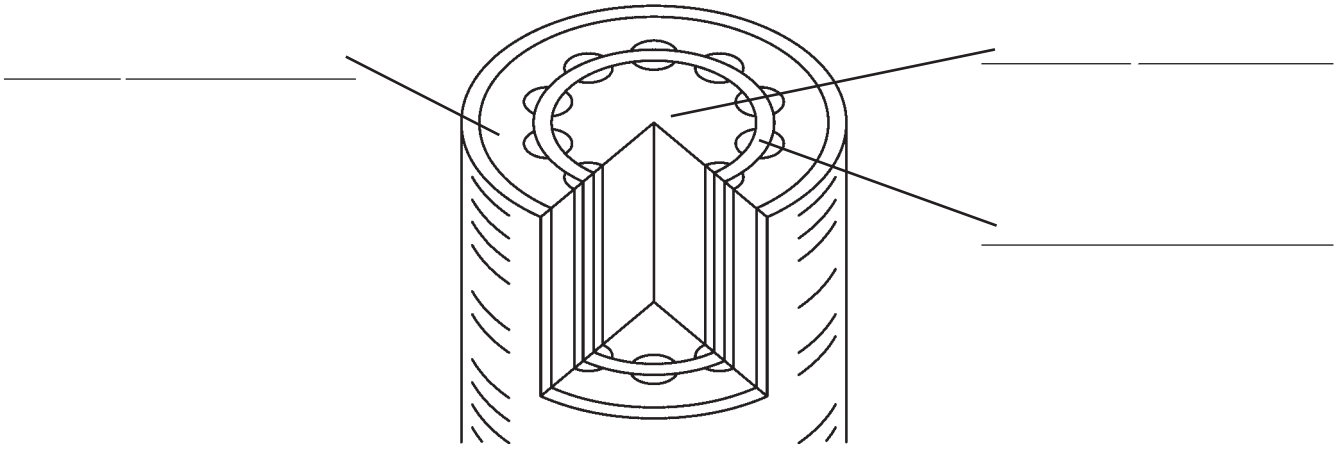
_____ materials move from cell to cell

Name _____ Date _____



# How Do Plants Move Materials?

**B. Use these terms to label the diagram of a vascular plant: *phloem, xylem,* and *vascular cambium*.**



**C. Put a check by each statement that is true about the movement of water and nutrients through a vascular plant.**

_____ Water moves up in plants because of three factors: root pressure, cohesion, and transpiration.

_____ Root pressure is strong enough to push water through a plant on its own.

_____ Water molecules cling to each other as a result of a force called cohesion.

_____ Adhesion forces water to go down.

_____ Water is pulled upward by transpiration.

_____ Gravity pulls sugar from the leaves down to nourish the plant.

_____ About 99% of the water that enters the roots is transpired by the leaves.

Name _____ Date _____



# How Do Plants Move Materials?

| | | |
|---|---|---|
| nonvascular plant | transpiration | xylem |
| phloem | vascular plant | |

**A. Match each word from the box with its description.**

_____ _____ conducts water and minerals from roots to stems and leaves

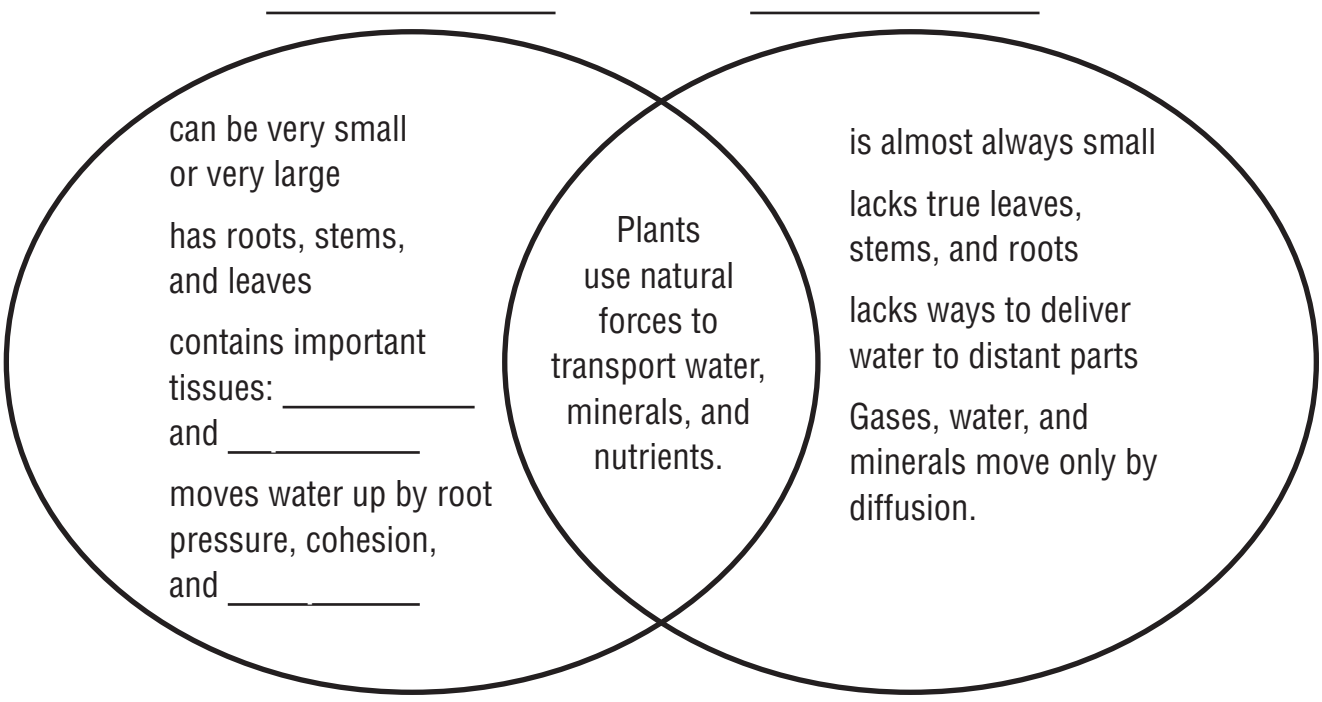
_____ _____ conducts sugar from leaves to the rest of the plant

_____ _____ evaporation of water through the surface of leaves

_____ _____ has specialized tissues that transport materials throughout it

_____ _____ lacks structures that transport sugar, water, and other materials between plant parts

**B. Complete the diagram to compare and contrast vascular plants and nonvascular plants.**



# How Do Plants Move Materials?

## Glossary

| | |
|---|---|
| **adhesion** | condition of holding to, sticking to |
| **cohesion** | attraction between molecules of the same kind |
| **gravity** | the natural force that causes objects to tend to move to the center of the Earth |
| **nutrient** | any substance that a living thing needs for energy, growth, and repair of tissues |
| **tissues** | a group of cells that are similar in form and function |

**Use the words from the box to complete the sentences about the flow of materials through a vascular plant.**

1. Sugar produced in the leaves of a plant being pulled down through the plant is an example of _____ _____ _____ at work.

2. Water molecules being attracted to other water molecules is an example of _____.

3. Glucose is an example of a _____.

4. Water molecules clinging to molecules of other substances is an example of _____.

5. Vascular _____ conduct water, minerals, and sugar between different parts of the plant.

**Homework:** Write a brief explanation of the process of transpiration. Use sequence words to help clarify the steps in the process.

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

**Main Idea** The respiratory system brings oxygen into the body and removes wastes. The circulatory system carries oxygen to the cells and carries away wastes.

- The respiratory system brings oxygen to the blood and removes carbon dioxide from the blood.
- The circulatory system brings oxygen and nutrients to cells and takes away carbon dioxide and other wastes.
- The heart is the central organ of the circulatory system.

**A. Complete the diagram to tell how the respiratory system delivers oxygen to the blood.**

When you inhale, you take oxygen-filled air into your _____ or _____.

↓

The air moves into a sturdy tube called the _____, which leads down your chest toward the _____.

↓

The trachea divides into two main tubes called _____.

↓

Inside the lungs each bronchus divides into smaller and smaller tubes, leading to grapelike sacs called _____.

↓

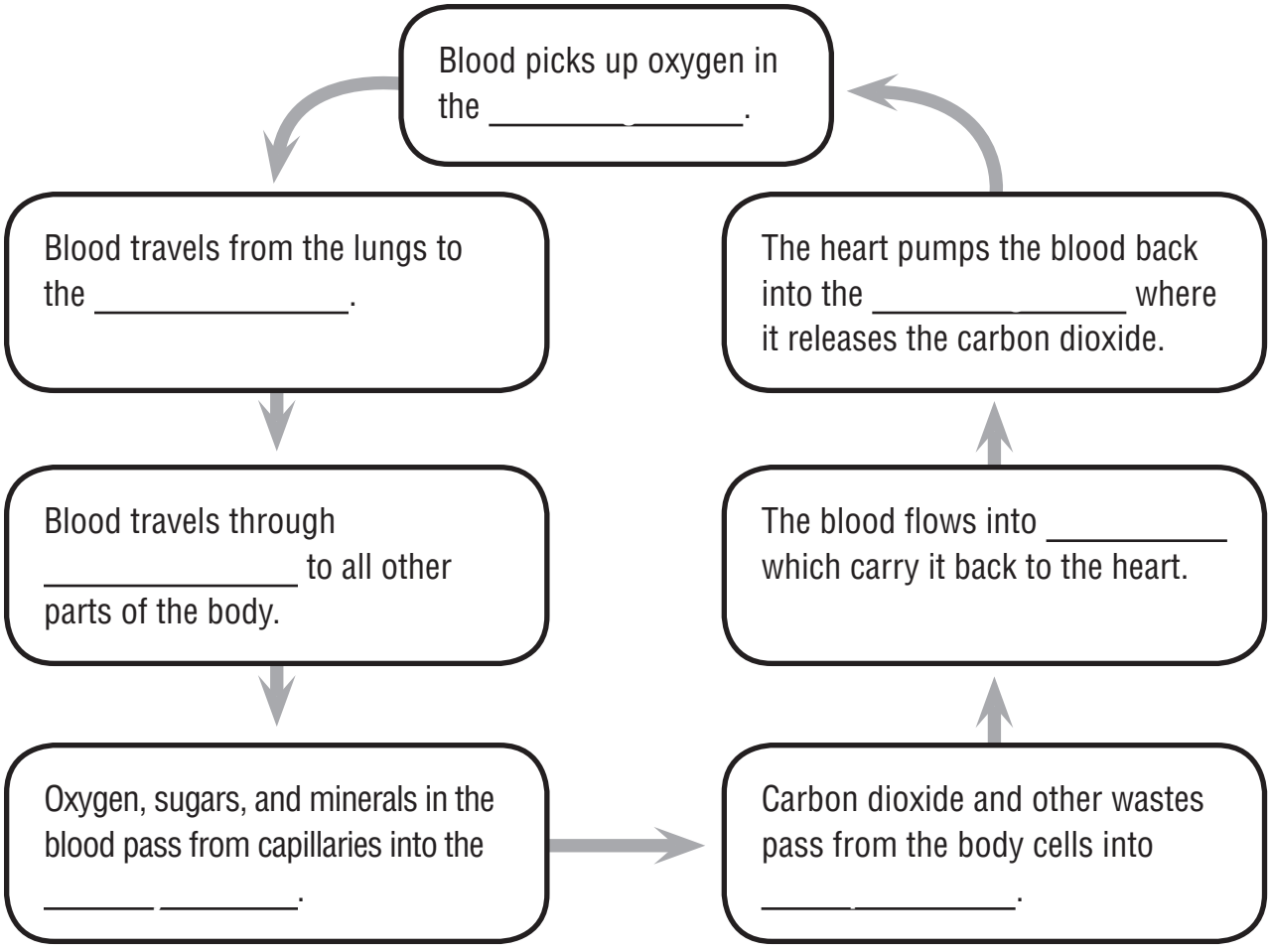
Each of these tiny structures borders a _____.

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

**B. Complete the diagram to show how blood circulates through the body.**




**C. Complete the sentences to tell about the human heart and its functions.**

1. The _____ is at the center of the circulatory system.
2. The four chambers of the heart are the ___ _____, the _____, the __ _____, and the _____.
3. The atria receive blood from the _____.
4. The _____ pump blood to the body.

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

| | | |
|---|---|---|
| artery | circulatory system | heart |
| capillary | respiratory system | vein |

**Use the words from the box to complete the sentences about the circulatory and respiratory systems. Some words may be used more than once.**

1. Nutrients pass through the wall of a _____ into the body cells.
2. A(n) _____ is a blood vessel that carries blood away from the heart.
3. The _____ brings oxygen and nutrients to the body's cells and removes carbon dioxide and other wastes from the cells.
4. The _____ is the organ that pumps blood through the circulatory system.
5. The lungs are the central organ of the _____.
6. Blood picks up oxygen in the _____.
7. A(n) _____ is a blood vessel that carries blood to the heart.

**Vocabulary Skill: Word Origins**

The word *circulatory* comes from the Latin word *circulus,* which means "circle or ring." Explain how the meaning of *circulus* relates to the circulatory system.

_____

_____

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

**Glossary**

| | |
|---|---|
| **alveoli** | tiny air sacs in the lungs |
| **bronchi** | two tubes leading from the trachea into the lungs |
| **hemoglobin** | a substance in red blood cells used to carry oxygen and carbon dioxide |
| **plasma** | the liquid part of the blood |
| **platelets** | small pieces of cells that help the blood clot |
| **trachea** | a sturdy tube that leads down the chest to the bronchi |

**Write the word from the box that matches each clue.**

_____ found in red blood cells

_____ leads to the bronchi

_____ carries air into the lungs

_____ help the body heal wounds

_____ carries blood cells

_____ bordered by a capillary

**Homework:** Draw a diagram that shows how blood is carried into the heart and out of the heart. Label the diagram.

Name _____ Date _____



# What Is the Digestive System?

**Main Idea** To function properly, living things need nutrients found in foods. The digestive system breaks down food to release these nutrients.

- The digestive system breaks down food into nutrients the body can use. Starches break down into sugars in the mouth.
- The stomach mixes and stores food. It further breaks down food into a soupy mix.
- Digestion finishes in the small intestine and nutrients are absorbed into the blood. Water and minerals are absorbed from the large intestine.

**A. Complete the outline about the digestive system.**

**I.** You must take in food.

**A.** Food provides the body with _____.

**B.** The body uses _____ of nutrients for _____.

**II.** Your body releases nutrients from food in a process called _____.

**A.** The _____ is a group of organs that breaks food down into _____ that the body can use.

**B.** These small particles enter the _____.

**III.** You should eat a _____ diet.

**A.** A balanced diet is made from a variety of _____.

**B.** _____ _____ helps your digestive system work properly.

**C.** You should avoid eating too many _____.

**IV.** You should eat _____ _____ every day.

**A.** Your body can store certain _____.

**B.** Many _____, however, cannot be stored.

Name _____ Date _____



# What Is the Digestive System?

**B. Complete the chart to tell about nutrients.**

| Nutrient | Uses | Examples |
|---|---|---|
| Carbohydrates | _____ | _____ |
| _____ | used to replace, repair, and grow new cells and tissues | _____ |
| Vitamins and minerals | _____ | _____ |
| _____ | _____ | butter, oil, ice cream |

**C. Use the numbers 1 through 9 to put the stages of digestion in order.**

_____ Chewed food moves into the esophagus.

_____ Undigested food and other substances pass to the large intestine.

_____ Food enters the small intestine where most digestion takes place.

_____ Digestion begins in the mouth.

_____ Nutrients from the digested food pass from villi into the blood.

_____ Water and minerals from food are absorbed into the blood.

_____ Chewing grinds food into smaller pieces, and saliva moistens the food and begins to break it down.

_____ The stomach squeezes the food and mixes it with digestive fluids.

_____ Remaining undigested food passes as solid waste.

Name _____ Date _____



# What Is the Digestive System?

| | | |
|---|---|---|
| digestive system | large intestine | stomach |
| esophagus | small intestine | |

**Use the words in the box to complete the paragraph about digestion. Some words may be used more than once.**

The _____ _____ _____ is a group of organs that breaks down food into small pieces the body can use. Food moves from the mouth to the stomach through the _____ _____ _____. The _____ is a muscular organ that stores and helps digest food. When food leaves the stomach, it enters the _____ where more digestion takes place. Nutrients from the digested food pass through villi in the _____ into the blood and to every cell in the body. Undigested food and other substances pass to the _____ _____.

**Vocabulary Skill: Word Origins**

The word *digestive* comes from the Latin word *digestus,* meaning "to divide or distribute." Write an explanation of the term *digestive system* using this information.

_____ _____ _____ _____ _____

_____ _____

Name _____ Date _____

# What Is the Digestive System?

**Glossary**

| | |
|---|---|
| **acid** | a corrosive chemical substance |
| **carbohydrates** | organic compounds that release energy when broken down by an organism |
| **enzymes** | substances produced by an organism that bring about specific biochemical reactions |
| **glands** | organs that secrete particular chemical substances |
| **nutrients** | substances that provide nourishment essential for growth and the maintenance of life |

**Use the words from the box to complete each sentence about the digestive system.**

1. Digestion helps to release_____ from food that the body can use.
2. People get most of the energy their bodies need from eating _____ _____.
3. Saliva is produced by_____ _____that are located at the back and bottom of the mouth.
4. The_____in saliva break down the starch in foods like bread and potatoes.
5. Digestive fluids in the stomach contain a(n) _____ that breaks down food.

**Homework:** Create a timeline to show how long it takes food to move through the digestive system. Begin your timeline with food entering the mouth.

Name _____ Date _____



# What Is the Excretory System?

**Main Idea** All living things produce wastes. In humans, the excretory system removes wastes and helps maintain water levels.

- Kidneys filter wastes from blood and produce urine.
- People with kidney problems can often be helped with dialysis or a kidney transplant.
- Plants and animals use different methods of removing wastes.

**A. Complete the diagram to tell about the excretory system.**

| Causes | Effects |
|---|---|
| The body produces a lot of _____. | The _____ removes it. |
| The body produces carbon dioxide. | The _____ remove it. |
| Blood carries wastes that contain _____. | The _____ converts nitrogen waste into _____. |
| Blood then contains_____. | The _____ filter out the urea from blood. |
| When urea and water are filtered by the kidneys, _____ results. | The _____ carry urine to the _____. |
| The _____ in the bladder causes it to increase in size. | Sensors detect its size and _____ _____ that it needs to be emptied. |

Name _____ Date _____



# What Is the Excretory System?

**B. Rewrite each statement about excretory system problems to make it true.**

1. If the excretory system works poorly or stops working, vitamins and minerals will gradually build up in the body.

   _____

   _____

2. Kidney disease can only occur in adults.

   _____

3. Drinking lots of water and eating a healthy diet are two important steps to keeping your ureters healthy.

   _____

   _____

**C. Put the steps in order to describe dialysis.**

_____ Waste and extra fluid are removed from the blood.

_____ Blood is filtered in a machine.

_____ Filtered blood is returned to the body.

_____ Blood containing wastes is removed from the body.

**D. Match each term with its waste removal system. Use each term only once.**

| | | |
|---|---|---|
| camels | mammals | plants |
| earthworms | plant cells | snakes |

_____ diffuse wastes directly to the outside

_____ change nitrogen wastes into uric acid

_____ make urea which they flush out with water

_____ make urine saltier than sea water

_____ often store wastes in a central vacuole

_____ may also keep wastes in unwanted parts

Name _____ Date _____



# What Is the Excretory System?

bladder excretory system kidney

**A. Use the words from the box to complete each sentence.**

1. The job of the _____ _____ is to remove wastes and to maintain water balance.
2. The _____ _____ is a bean-shaped organ located near the middle of the back.
3. The _____ is a muscular bag that holds urine.

**B. Write a word from the box next to each phrase that describes it. Some words may be used more than once.**

_____ sensors detect its size and signal the brain when it needs to be emptied.

_____ filters urea from the blood

_____ helps the body maintain the right water balance

_____ involves different processes and organs spread throughout the body

_____ surrounded by a layer of fat for protection

_____ connected to kidneys by ureters

**Homework:** Write two or three sentences that explain how the kidneys and bladder work together in the excretory system.

# What Is the Excretory System?

## Glossary

| | |
|---|---|
| **dialysis** | process of cleansing the blood artificially |
| **filter** | straining out substances from a liquid or gas by slow passage through tissues, cloth, paper, sand, or charcoal |
| **urea** | substance present in the urine of mammals |
| **urine** | the liquid waste product that is produced by the kidneys |
| **wastes** | materials that the body cannot use |

**Use the words from the box to complete the paragraph about the excretory system. Some words may be used more than once.**

The excretory system removes _____ from the body. As key organs of the excretory system, the kidneys _____ the blood and produce _____. The urine of all mammals contains _____. If a person's kidneys are not working, _____ can be removed from the blood by _____ _____. In this process, a machine is used to _____ out _____ and other fluids.

**Vocabulary Skills: Word Origins**

The word *dial* comes from a Latin word meaning "day." The face of a sundial was called "the wheel of day" and people started using the word for other marked circles. How does the origin of *dialysis* relate to its meaning?

_____ _____ _____ _____

_____ _____ _____ _____

Name _____ Date _____



# Where Is Earth's Water?

**Main Idea** Most of Earth's water is salt water contained in the oceans.

- Oceans and seas make up 97 percent of Earth's water.
- Earth's fresh water is located in rivers, lakes, underground, and as ice in glaciers.
- Distillation and reverse osmosis are processes used to remove salt from salt water.

**A. Complete the diagram to tell about salt water oceans and seas.**

As water from runoff moves across the land, it dissolves _____ _____ in _____.

↓

The runoff carries salts and other minerals into _____.

↓

Eventually, the rivers empty into _____, bringing the salts and other minerals with them.

↓

Over time—millions of years—the deposits accumulate, making the water _____.

**B. Complete the diagram to tell why fresh water is a valuable resource.**

Fresh Water: A Valuable Resource

- Much of the fresh water supply is _____ _____.
- It is _____ _____ over Earth's surface.
- _____ can damage the water supply.

Name _____ Date _____

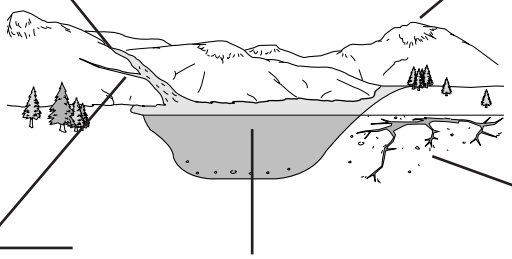


# Where Is Earth's Water?

**C. Complete each sentence in the diagram to identify sources of Earth's fresh water.**

A(n) _____ is a body of water that flows downhill in a channel.

About two-thirds of Earth's fresh water is "locked away" as ice in _____.



A(n) _____ is a small river.

_____ are bodies of water surrounded by land.

_____ is water that collects in spaces and cracks in rocks and soil underground.

**D. Complete the chart to tell about the process of desalination.**

| Desalination |
|---|
| **Processes**<br>**1.** Distillation: _____<br>_____.<br>**2.** Reverse osmosis: _____<br>_____. |
| **Drawbacks**<br>**1.** The desalination plants are _____.<br>**2.** The plants produce brine, which can _____<br>_____. |

Name _____ Date _____



# Where Is Earth's Water?

groundwater runoff desalination

**Match each word from the box to the statement that describes it. Each word will be used more than once.**

___ _____ water that collects in spaces and cracks in rocks and soil underground

_____ the main source of salt in oceans and seas

___ _____ one of the two main sources of fresh water

_____ the removal of salt from salt water to make fresh water

_____ rainwater that flows over land without sinking into the soil

_____ provides less than one percent of the world's fresh water

_____ carries salts and other minerals into streams and rivers

___ _____ makes up about 94 percent of Earth's usable fresh water supply

_____ an expensive process that produces brine

**Homework:** Explain the difference between surface water and groundwater in a few sentences.

Name _____ Date _____



# Where Is Earth's Water?

## Glossary

| | |
|---|---|
| **condenses** | changes from a gas or vapor to a liquid |
| **distillation** | the process of boiling a liquid and condensing and collecting the vapor to purify the liquid |
| **evaporates** | changes from a liquid to a gas or vapor |
| **membrane** | a thin sheet or skin |
| **molecules** | groups of two or more atoms joined together in a chemical bond |
| **osmosis** | the movement of a solvent through a membrane separating two solutions of different concentrations |

**The Process of _____**

Ocean water is collected and heated.

↓

The hot water _____ and becomes water vapor, leaving the solid salts behind.

↓

In a separate chamber, the water vapor is cooled and _____ back into liquid fresh water.

**The Process of Reverse _____**

Salt water is pumped at high pressure through a thin membrane.

↓

Holes in the membrane let water _____ pass through, but trap dissolved salts.

↓

Fresh water is produced.

**Vocabulary Skill: Multiple-Meaning Words**

**The word *condense* has more than one meaning. Write two meanings this word can have. Use a dictionary to help you.**

_____

_____

_____

Name _____ Date _____



# How Do Communities Get Water?

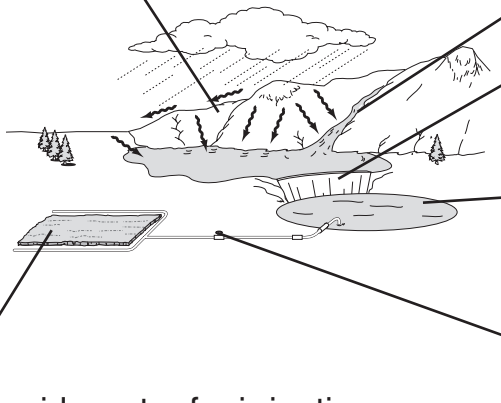
**Main Idea** Communities get fresh water from both underground sources and surface sources.

- Rivers provide drinking water.
- Dams create reservoirs that collect and store water for drinking and irrigation.
- Groundwater from wells and springs supply drinking water.
- Drinking water is processed in purification plants.

**A. Complete each sentence to identify the sources and systems that provide Californians with fresh water.**

Only about 35% of the _____ and _____ that falls in California becomes _____ that supplies rivers and lakes.

_____ provide much of the drinking water for millions of Californians.



_____ create reservoirs.

A(n) _____ is a place that collects and stores water.

Reservoirs also provide water for irrigation, the supplying of _____ to farm fields.

A(n) _____ is a system of channels, pipes, and tunnels that carries water a long distance.

Name _____ Date _____

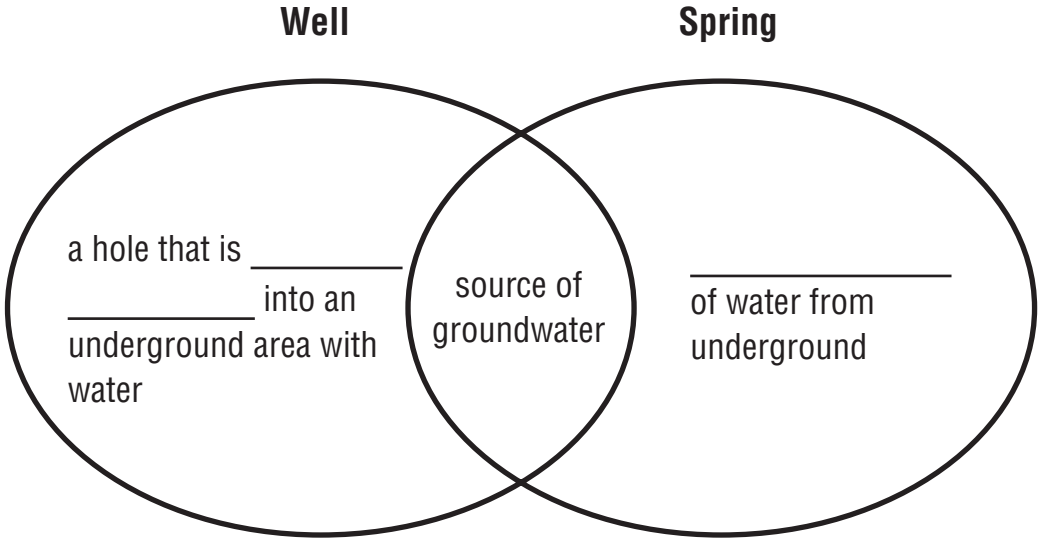


# How Do Communities Get Water?

**B. Complete the sentences to tell about groundwater.**

1. The source of most groundwater is _____ that sinks into the _____.
2. Water at the surface seeps downward until it reaches a layer of _____ or _____.
3. Water cannot _____ this layer, so it fills in the spaces in soil and rock _____.
4. When all the _____ are filled with _____, the ground is said to be _____.

**C. Complete the diagram to compare and contrast wells and springs.**



Name _____ Date _____



# How Do Communities Get Water?

| | | | |
|---|---|---|---|
| aquifer | aqueduct | irrigation | reservoir |
| spring | water table | watershed | well |

**Use a word from the box to complete each sentence about the water supply.**

1. A(n) _____ is a region of land that drains into a river.

2. _____ _____ is the supplying of fresh water to farm fields.

3. A(n) _____ _____ is a natural flow of water from underground.

4. A(n) _____ _____ is a system of channels, pipes, and tunnels that carries water a long distance.

5. A(n) _____ is a place that collects and stores water.

6. An underground layer of rock or soil through which water moves easily is a(n) _____ _____.

7. The surface of a layer of saturated ground is the _____.

8. A(n) _____ is a hole dug or drilled into an underground area saturated with water.

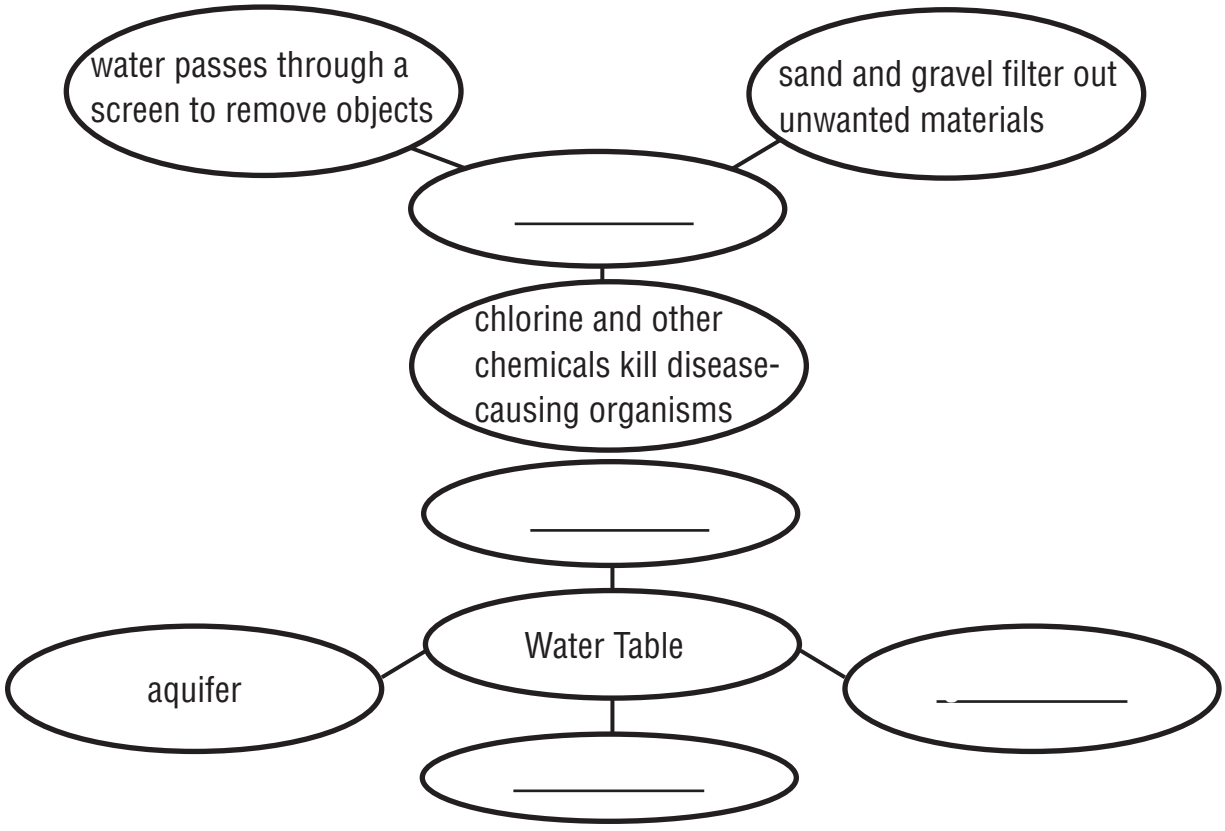
**Homework:** Write a short paragraph explaining why aqueducts are necessary in parts of California.

# How Do Communities Get Water?

## Glossary

| | |
|---|---|
| **groundwater** | water beneath the surface of the earth |
| **precipitation** | water, such as rain, snow, or sleet that falls to the surface of Earth |
| **purification** | the act of cleansing or purifying water |
| **wetland** | a lowland area that is saturated with water |

**Use words from the box to complete the diagrams.**




**Vocabulary Skill: Multiple-Meaning Words**

**The word *root* has more than one meaning. Write two meanings this word can have.**

_____

_____

_____

Name _____ Date _____



# How Can Fresh Water Be Used Wisely?

**Main Idea** Water should be conserved in order to make fresh water supplies last longer.

- California's growing population and crops need huge amounts of fresh water.
- About 1,300 dams and reservoirs, six major aqueduct systems, and other structures shift water from wetter areas to drier areas.
- Californians can conserve water by recycling and by decreasing their use of water.

**A. Complete the cause-and-effect diagram about California's water needs.**

| Causes | Effects |
|---|---|
| California has the _____ population of any state. | The state faces big challenges in providing enough _____ to everyone. |
| The state's people and farm fields are not close to its major water _____. | A large system of canals, pipes, aqueducts, dams, pumps, and reservoirs serve to _____ water. |
| Californians' water needs have begun to grow _____ than their supply. | New steps are being taken so that _____ has the water they need. |

Name _____ Date _____

B.4.3
Main Idea

# How Can Fresh Water Be Used Wisely?

**B. Rewrite each statement about California's water supply to make it true.**

1. The 238-mile-long Los Angeles Aqueduct brings water from Los Angeles over the mountains to Owens Valley.

_____

_____

2. The Sacramento-San Joaquin River system supplies water to northern California.

_____

_____

3. The Colorado River Aqueduct carries river water from the Colorado to the city of Los Angeles.

_____

_____

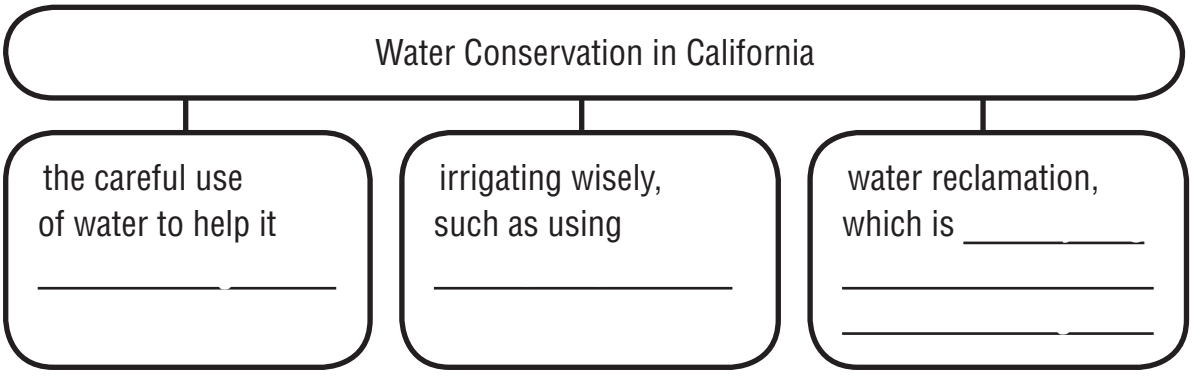
4. "The 4.4 Plan" is an agreement between the states that share water from the Sacramento River and promotes laws and practices that increase water use.

_____

_____

_____

**C. Complete the diagram to tell about water conservation.**




**Homework:** Make a list of what you do to help conserve water.

Name _____ Date _____



# How Can Fresh Water Be Used Wisely?

conservation water reclamation

**Match the words from the box with the phrases below.**

_____ **1.** the careful use of a natural resource

_____ **2.** replacing old toilets with newer models that use less water

_____ **3.** recycling waste water

_____ **4.** taking shorter showers

_____ **5.** between 50 and 75 percent of waste water from homes and offices could be reused to wash cars or to water lawns

_____ **6.** turning off the water as we brush our teeth

**Vocabulary Skill: Suffixes**

**Some nouns can be formed by adding the suffix -*tion* to the verb form. Explain how to form a noun from the word *conserve*.**

_____

_____

# How Can Fresh Water Be Used Wisely?

## Glossary

| | |
|---|---|
| **encourage** | to stimulate; spur |
| **irrigate** | to supply with water by means of streams or pipes |
| **recycling** | extracting useful materials from waste |
| **resource** | an available supply that can be drawn upon as needed |
| **seeps** | passes slowly through small openings |

**Use the words from the box to complete the sentences about water conservation.**

1. Conserving a _____ will help it last longer.
2. Most of California's water is used to _____ _____ farms and crops.
3. Much of the water used from irrigation canals evaporates, runs off the land, or _____ into soil.
4. The state of California has passed laws to _____ _____ water conservation.
5. One law addresses water reclamation, the _____ of waste water.

**Vocabulary Skill: Prefixes**

The prefix *re-* means "once more" or "again" when added to a base word. How does knowing this prefix help you understand the meaning of *recycle*? Use an example to help you answer the question.

_____

_____

_____

_____

_____

Name _____ Date _____



# How Does Water Change State?

**Main Idea** On Earth, water exists in three states: liquid water, solid ice, and a gas called water vapor. Water changes from one state to another in processes that make up the water cycle.

- Earth's fresh water is cleaned and renewed in the processes that make up the water cycle.
- Liquid water evaporates and changes to water vapor in the air. When cooled, it changes back to a liquid or a solid and falls to Earth as rain, sleet, snow, or hail.
- Groundwater collects in underground spaces between soil and rock. Runoff is water that flows over the ground, eroding the soil.

**A. Put a check next to each statement that is true about water in the environment.**

_____ **1.** The water cycle is a natural process that restores and cleans Earth's water supply.

_____ **2.** Only 30 percent of the Earth's surface is covered with water.

_____ **3.** Unwanted materials can pollute water on Earth's surface.

_____ **4.** Most fresh water on Earth is found underground and in glaciers and ice caps.

_____ **5.** The water cycle adds pollution to Earth's fresh water supply.

_____ **6.** Water exists in only two states: liquid water and water vapor.

_____ **7.** People use fresh water for drinking, cooking, and growing food.

_____ **8.** About 97 percent of the Earth's water is salt water.

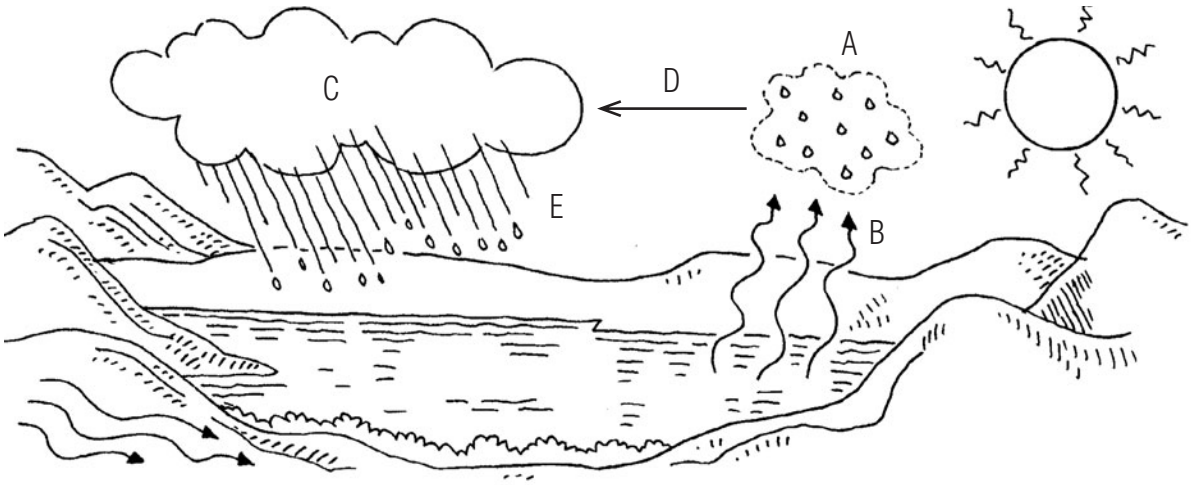
_____ **9.** In the water cycle, water moves from the Sun to Earth's surface.

Name _____ Date _____



# How Does Water Change State?

**B. Use the diagram below to answer the questions about the water cycle.**




**1.** What is shown as A?

_____

**2.** What part of the water cycle is illustrated by B?

_____

**3.** What is shown as C?

_____

**4.** What part of the water cycle is illustrated by D?

_____

**5.** What part of the water cycle is illustrated by E?

_____

**6.** What are four types of precipitation?

_____

**C. Explain how groundwater and runoff are different.**

_____

_____

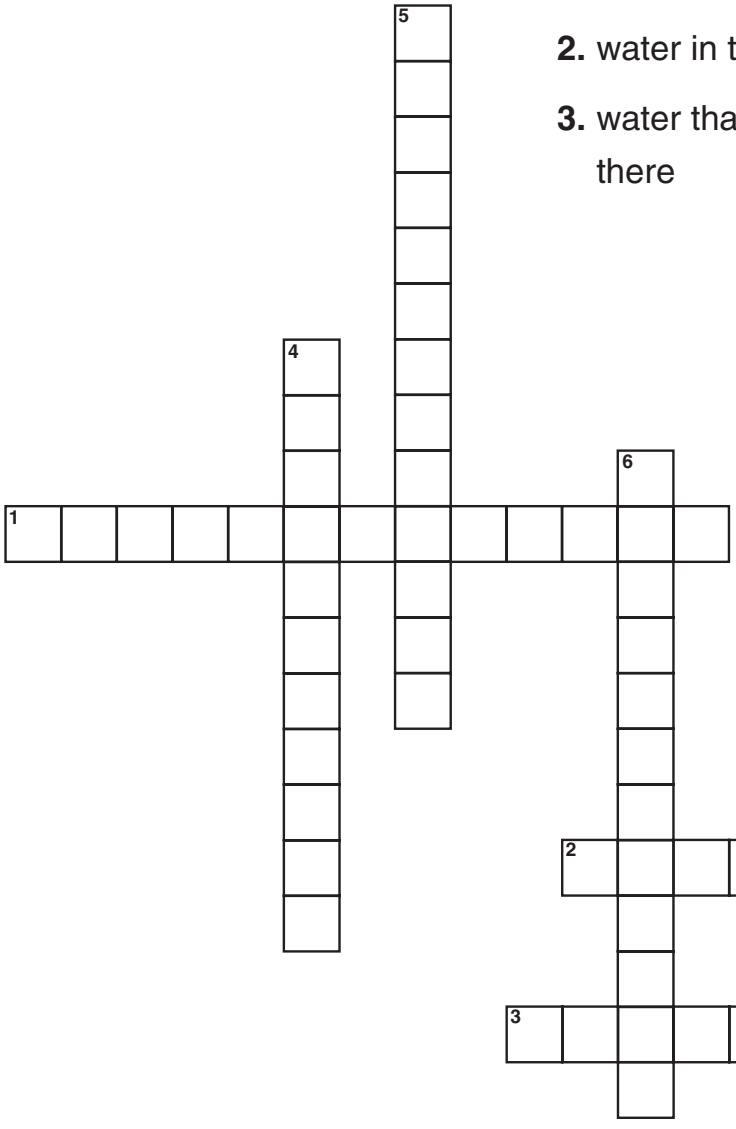
_____

_____

# How Does Water Change State?

| | | |
|---|---|---|
| condensation | evaporation | groundwater |
| precipitation | transpiration | water vapor |

**Use the words from the box to complete the puzzle about the water cycle.**




**Across**

**1.** any form of water that falls to Earth's surface from clouds

**2.** water in the form of a gas

**3.** water that soaks into the ground and collects there

**Down**

**4.** a liquid changing to a gas

**5.** a process in which the leaves of plants release water vapor into the air

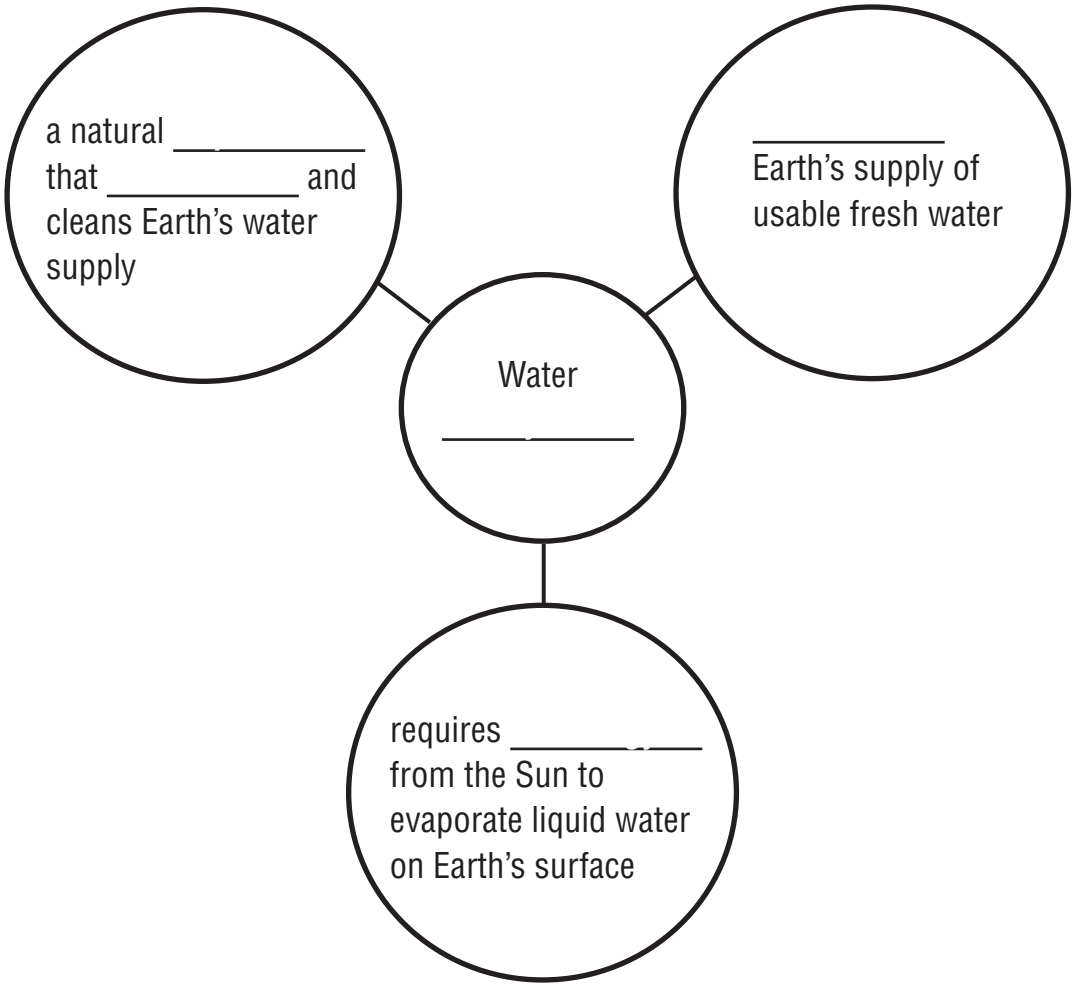
**6.** the change of state from a gas to a liquid

# How Does Water Change State?

## Glossary

| | |
|---|---|
| **cycle** | a series of events that happen one after another in the same order, over and over again |
| **energy** | the capacity for work or vigorous activity |
| **process** | a series of actions performed in making or doing something |
| **renews** | to make new or as if new again |
| **restores** | to bring back into existence or use |

**Use words from the box to complete the diagram about the Water Cycle.**




**Homework:** Write a paragraph that explains how water changes from one state to another in the water cycle.

Name _____ Date _____



# How Does Precipitation Form?

**Main Idea** Clouds form and release precipitation as rain, snow, sleet, and hail.

- As moist air rises, water vapor condenses and clouds can form.
- Luke Howard described four classes of clouds.
- Rain, sleet, snow, and hail are the major forms of precipitation.

**A. Number the events below to show the order in which they occur.**

_____ The rising warm air gradually cools.

_____ The Sun warms Earth's surface.

_____ The cold air sinks back to the ground.

_____ The warm air rises further above Earth's surface.

_____ The air just above Earth's surface warms, too.

**B. Complete the diagram about cloud formation.**

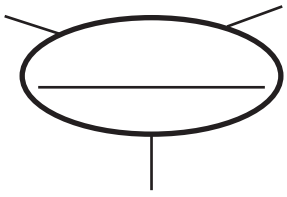
| Causes | Effects |
|---|---|
| Warm air rises in a convection current. | The air carries _____ with it. |
| The air cools. | The water vapor _____ around tiny specks of dust or salt, forming tiny _____. |
| The droplets remain suspended in the air. | _____. |

Name _____ Date _____

B.5.2
Main Idea

# How Does Precipitation Form?

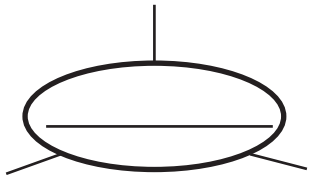
**C. Complete the diagrams to identify the four major forms of precipitation.**



begins as small drops of _____

reaches ground as tiny _____ _____

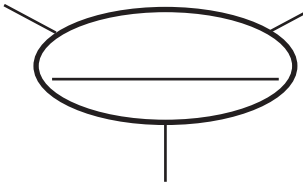
drops fall through air that is _____ than water's freezing point



produced when temperature in cloud is _____ enough to form ice crystals

type of flakes depends on temperature of cloud

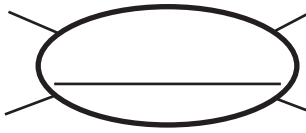
made up of _____ and pellets of ice



made up of round chunks of _____

chunks grow _____ as coats of ice are added inside cloud

begins to form when drops of rain _____ inside a cloud with cold updraft winds



can form when tiny cloud droplets _____

drops of _____ water

can begin as _____

most common form of _____

# How Does Precipitation Form?

| | |
|---|---|
| convection current | dew point |
| humidity | |

**Use the words from the box to complete each sentence about precipitation.**

1. The temperature at which air becomes saturated is its _____ _____.
2. _____ _____ is the amount of water vapor in the air at any given time.
3. A _____ is a continuous loop of moving air or liquid that transfers energy.
4. If the air temperature drops below the _____ _____, water condenses and clouds or fog form.
5. One reason that _____ _____ changes is because the temperature changes.
6. When the _____ ___ is 100 percent, the air is said to be saturated.

**Vocabulary Skill: Root Words**

The word *humidity* comes from the Latin word *humere*, which means "to be moist." Explain how knowing the meaning of the root helps you understand the meaning of *humidity*.

_____ _____ _____ _____ _____

_____ _____

# How Does Precipitation Form?

**Glossary**

| | |
|---|---|
| **cirrus** | a cloud composed of feathery white patches, bands, or streamers of ice crystals, found typically at high altitudes |
| **cumulus** | a dense, white, fluffy cloud that billows upward from a flat base |
| **cumulonimbus** | a very dense cloud with massive projections that billow upward to great heights, usually producing heavy rains, thunderstorms, or hailstorms |
| **stratus** | a low-lying grayish cloud that resembles a layer of fog |

**Use the words from the box to complete the chart about the different types of clouds. Then answer the question that follows.**

| Type of Cloud | Description |
|---|---|
| _____ | These clouds form in layers and may cover large parts of the sky. Some may bring rain. |
| _____ | These are puffy, white clouds with flat bottoms. They form in rising columns of warm air and generally mean the weather is fair. |
| _____ | These high altitude clouds are thin and wispy, and made of ice crystals. They indicate that pleasant weather may change to rain. |
| _____ | These clouds may bring heavy rain or thunderstorms. They may extend up through the troposphere. |

Why do clouds stay in the sky?

_____

_____

**Homework:** Write a short paragraph describing the types of precipitation that fall in your city or town.

Name _____ Date _____



# How Does the Ocean Affect Weather?

**Main Idea** Oceans have a major effect on Earth's weather and climate.

- Earth's oceans warm and cool more slowly than its lands because water has a relatively high specific heat capacity.
- Ocean currents move warm and cold water around the oceans, helping to even out Earth's temperatures.
- Oceans help to moderate the climate of places near them, such as California.

**A. Complete the summary about heating and cooling land and water.**

The _____ is the amount of energy it takes to raise the temperature of 1 gram of a material by 1°C. Land and water have different specific heat capacities. In general, land heats up _____ and reaches _____ temperatures than do bodies of water. Land areas also lose heat _____ and drop to _____ temperatures. As a result, it takes more _____ and _____ to heat ocean water than it does to heat nearby land.

**B. Put a check next to each description of surface ocean currents that is true.**

_____ move vertically within ocean

_____ can be warm or cold

_____ form because of differences in water temperature and salinity

_____ move in great circles

_____ driven by surface winds and the effects of Earth's rotation

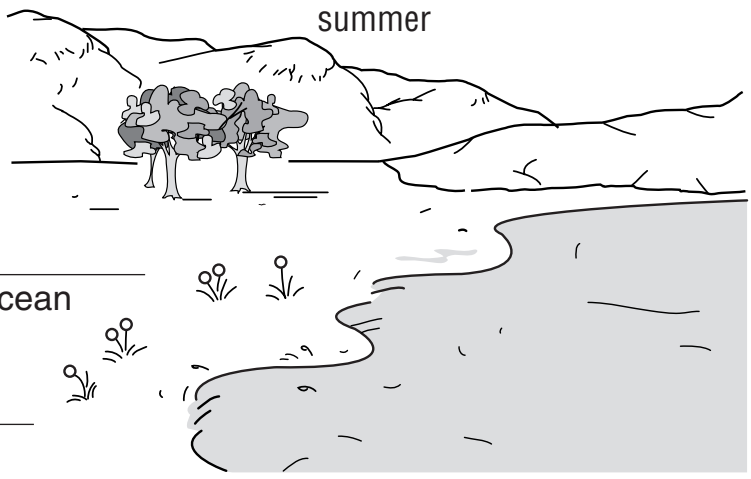
_____ help balance temperatures at Earth's surface

Name _____ Date _____



# How Does the Ocean Affect Weather?

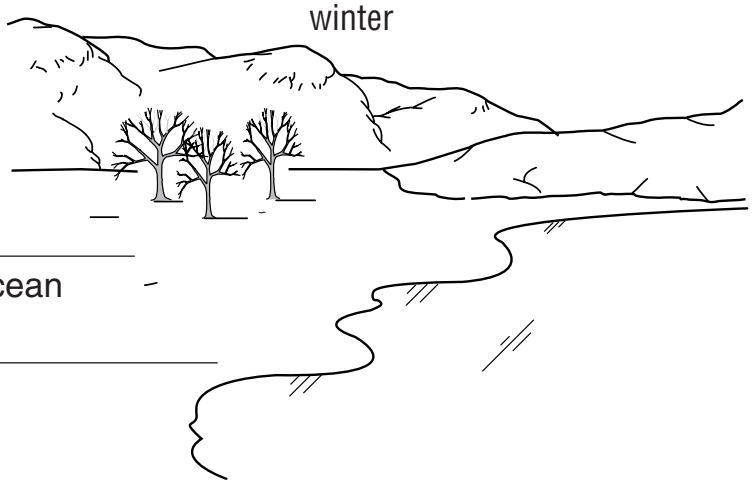
**C. Fill in the blanks to tell how oceans help to moderate the climate of places near them.**




land is _____ away from ocean

coastland is _____

Ocean water holds winter's coldness longer than land.




land is _____ away from ocean

coastland is _____

Ocean water holds summer heat longer than land.

Name _____ Date _____



# How Does the Ocean Affect Weather?

ocean current

**Rewrite each sentence to make the statement about the movement of ocean water true.**

**1.** An ocean current is an area of cold water in the ocean.

_____

**2.** Water that flows within a current has a wide range of temperatures and densities.

_____

**3.** Ocean currents move cold water around Earth's oceans. This helps cool the temperature of nearby land.

_____

_____

**4.** There are three types of ocean currents—shallow currents, salty currents, and wave currents.

_____

_____

**Vocabulary Skill:**
**Multiple-Meaning Words**

**The word *current* has more than one meaning. Write a sentence with the word *current* using the same meaning that is found in the lesson.**

**Write another sentence using a different meaning.**

_____

_____

_____

Name _____ Date _____



# How Does the Ocean Affect Weather?

## Glossary

| | |
|---|---|
| **energy** | the capacity for work or vigorous energy |
| **land** | any part of Earth's surface that is not water |
| **ocean** | the whole body of salt water that covers nearly three-fourths of Earth's surface |
| **temperature** | the degree of heat or cold |
| **warm** | somewhat hot; not cold |

**Use a word from the box to complete the paragraph about ocean effects on weather and climate.**

How much _____ _____ does it take to raise the _____ _____ of 1 gram of water by 1°C? The term used to describe this amount is specific heat capacity. Water and _____ have different specific heat capacities. In general, land heats up faster and cools faster than bodies of water do. For this reason, oceans hold the heat of summer long into winter. During winter, the _____ warms nearby lands, which remain milder than they would if the ocean were not there. Oceans also hold the coldness of winter into the _____ months of summer. During summer, the ocean cools nearby lands.

**Homework:** Define an **ocean current**. Tell where warm currents move warm ocean water and where cold currents move cold ocean water.

Name _____ Date _____

C.6.1
Main Idea

# How Does Air Pressure Affect Weather?

**Main Idea** Earth's atmosphere is a mixture of gases that surrounds the planet. The atmosphere exerts a pressure that decreases with distance above Earth's surface.

- Earth's atmosphere is made up mostly of nitrogen and oxygen.
- Air pressure is the force air exerts on Earth. Air pressure at Earth's surface is always changing.
- Low-pressure systems are associated with changing weather. High-pressure systems are associated with fair weather.

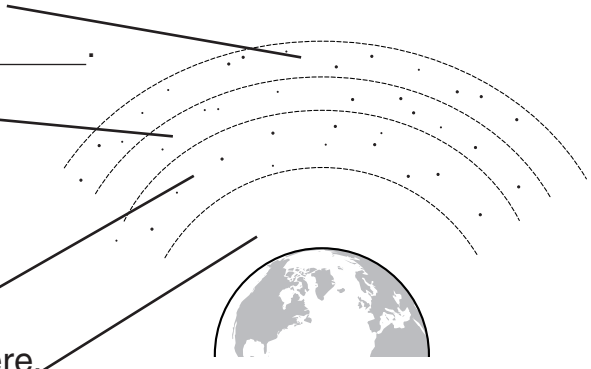
**A. Fill in the blanks to tell about the different layers of Earth's atmosphere.**

The _____ is the first part of Earth's atmosphere struck by _____ _____.

The top of the _____ has the _____ temperatures in Earth's atmosphere.

The _____ contains most of the _____ in Earth's atmosphere.

The _____ contains about 75 percent of the _____ in Earth's atmosphere.



**B. Fill in the blanks to tell about air pressure and altitude.**

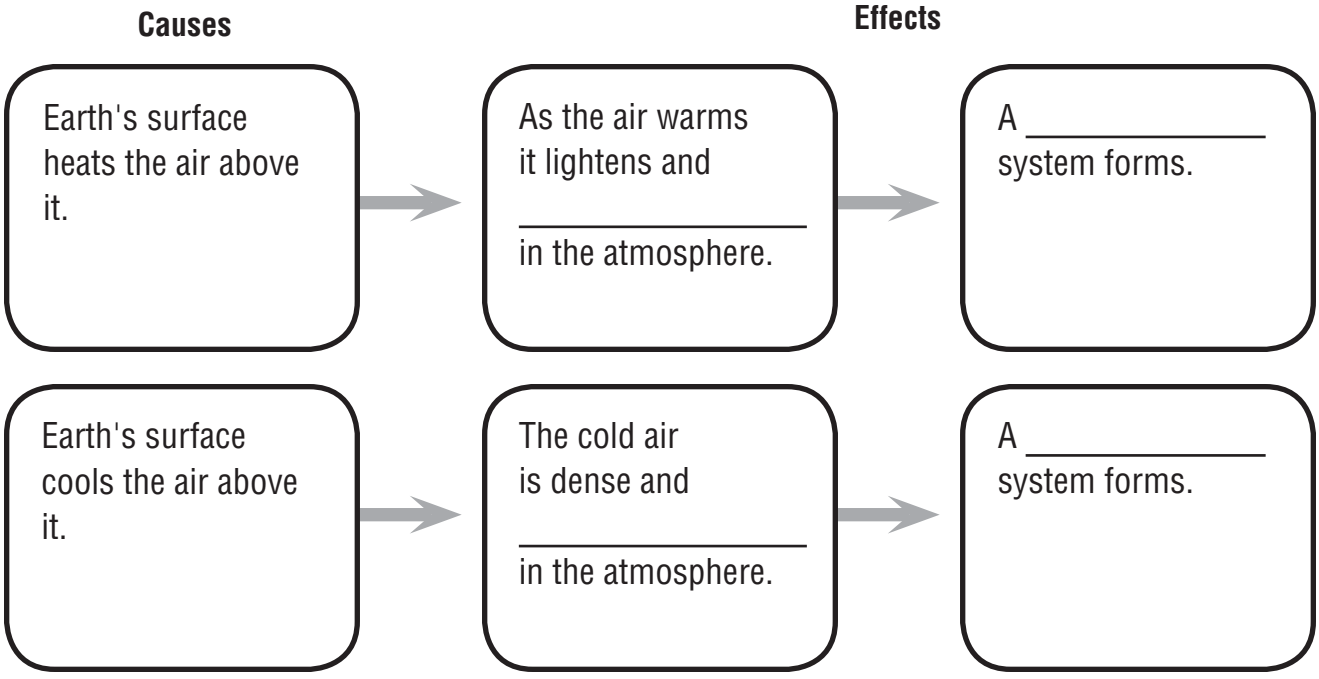
1. The air pressure in the _____ is greater than the air pressure in any other layer in the atmosphere.
2. As the distance from Earth's surface increases, the air pressure _____.
3. Air pressure decreases with altitude because there are _____air molecules as you move away from Earth's surface.

Name _____ Date _____

C.6.1
Main Idea

# How Does Air Pressure Affect Weather?

**C. Complete the diagram to tell how air pressure systems form in Earth's atmosphere.**




**D. Rewrite each sentence to make the statement about air pressure and weather true.**

**1.** Clouds can form as warmer, lighter air rises in the atmosphere, which is why high-pressure systems are associated with unsettled weather.

_____

_____

_____

**2.** Low-pressure systems are associated with fair weather because clouds cannot form when cooler, heavier air sinks in the atmosphere.

_____

_____

_____

Name _____ Date _____



# How Does Air Pressure Affect Weather?

air pressure  atmosphere  weather

**Write the word from the box next to its description. The words will be used more than once.**

_____ **1.** the force exerted by air on a given area

_____ **2.** overall condition of the atmosphere at a given time and place

_____ **3.** affected by factors such as humidity, wind speed, and temperature

_____ **4.** it's divided into four main layers

_____ **5.** affected by the air pressure in a given area

_____ **6.** a mixture of gases that surround the planet

_____ **7.** it generally decreases with altitude

_____ **8.** made up mostly of nitrogen and oxygen

_____ **9.** an effect of the Sun's uneven heating of Earth's surface

**Homework:** Write a short paragraph describing how high-pressure and low-pressure systems affect the weather.

Name _____ Date _____



# How Does Air Pressure Affect Weather?

## Glossary

| | |
|---|---|
| **axis** | a straight line around which an object rotates |
| **force** | a push or a pull |
| **fossil fuels** | fossil materials that burn, such as coal, oil, or natural gas |
| **molecules** | groups of two or more atoms linked together |
| **radiation** | energy in the form of electromagnetic waves or particles |
| **water vapor** | water in its gaseous state |

**Use a word from the box to complete each sentence.**

1. Near oceans or large lakes, _____ can make up as much as four percent of the air.
2. Burning _____ increases the amount of carbon dioxide in the atmosphere.
3. _____ from the Sun can harm living things.
4. As you move away from Earth's surface, there are fewer air _____.
5. Air exerts a(n) _____ equally in all directions.
6. As Earth revolves around the Sun, the tilt of its _____ affects the heating of Earth's surface.

**Homework:** Write a paragraph that explains how the tilt of Earth's axis affects the heating of its surface by the Sun.

Name _____ Date _____



# Why Does Air Move?

**Main Idea** Wind is caused by differences in air pressure. These differences create both local winds and planetary winds.

- Wind is the movement of air from areas of high pressure to areas of low pressure.
- All winds are part of convection currents in the atmosphere.
- Planetary winds affect large areas of Earth.

**A. Complete the paragraph to tell about air pressure.**

The _____ heating of Earth's surface causes differences in _____ _____. When air is warmed, it becomes _____ than surrounding air. When air is _____, it becomes denser than the surrounding air. This creates local high-pressure and low-pressure systems that affect _____ across the globe.

**B. Answer the following questions to compare the different types of local breezes.**

**1.** What are valley breezes?

_____

_____

_____

**2.** What are land breezes?

_____

_____

_____

Name _____ Date _____



# Why Does Air Move?

**C. Number the statements in the correct order to tell about the mountain effect.**

_____ Dry winds sweep down the leeward side of the mountain.

_____ In the colder air at higher elevations, water vapor condenses to form clouds.

_____ Water from the ocean evaporates into water vapor in the air.

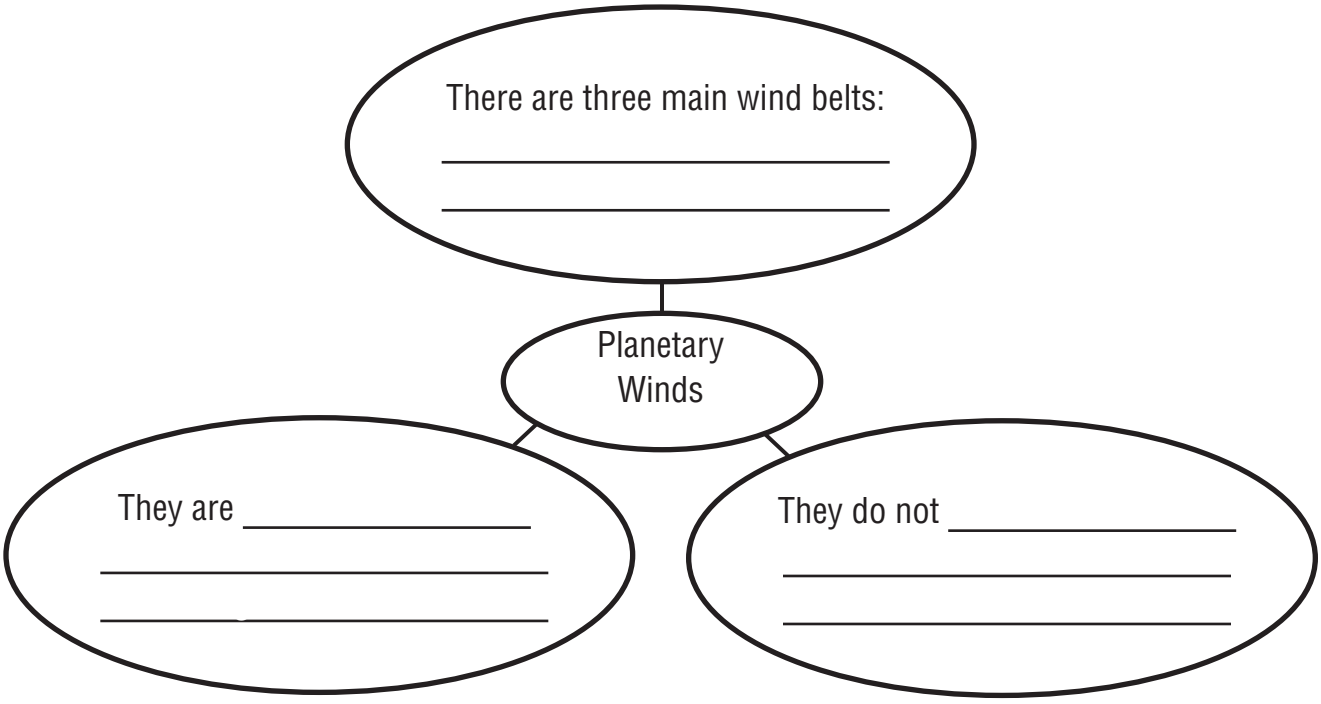
_____ Air that crosses over the mountain has very little moisture left.

_____ Sea breezes carry the moist air toward land.

_____ Rain or snow may fall along the windward side of the mountain.

_____ Moist air is forced up over the mountains.

**D. Complete the diagram to tell about planetary winds.**




**Homework:** Write a paragraph explaining how the jet stream and planetary wind belts affect weather systems.

# Why Does Air Move?

| | | |
|---|---|---|
| jet stream | land breeze | mountain breeze |
| valley breeze | sea breeze | planetary winds |

**Rewrite the underlined portion of each statement to make it true.**

**1.** A mountain breeze occurs during the day when warm air rising from a mountain slope is replaced by cooler air from the valley moving in to replace it.

_____

_____

**2.** Planetary winds, like local breezes, are regional winds that affect a limited area of Earth.

_____

_____

**3.** A land breeze occurs during the day when cool air from the sea moves in to replace warm air rising over the sea.

_____

_____

**4.** Jet streams are the three wind belts in each hemisphere of Earth.

_____

**5.** A sea breeze blows from water to land and occurs during the day when warm air over the sea moves in to take the place of cool air rising over the land.

_____

_____

**6.** A valley breeze occurs at night when cool air from the valley rises up mountain slopes to replace the cool air rising over the slopes.

_____

_____

Name _____ Date _____

# Why Does Air Move?

**Glossary**

| | |
|---|---|
| **belts** | geographic regions that are distinctive in some way |
| **circulation** | the process of moving or flowing along a path |
| **friction** | the rubbing of one object or surface against another |
| **global** | of the entire Earth; worldwide |
| **prevailing** | most common |

**Use words from the box to complete the paragraph to tell about global weather.**

The uneven heating by the Sun of Earth's surface creates differences in air pressure. These differences in air pressure result in planetary winds. Planetary winds are long-lasting _____ patterns that affect large areas of Earth. Three main wind _____ cover each hemisphere. These winds do not travel in straight lines. They are directed by Earth's rotation and _____ with the surface. Planetary winds curve to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

Jet streams are another system of _____ _____ winds occurring in the troposphere. Planetary winds and jet streams affect the direction in which weather systems move. For example, the _____ _____ _____ westerlies blow from west to east across the United States. They have a great effect on U.S. weather.

**Vocabulary Skill: Prefixes**

**The prefix *un-* means "not." It usually changes a word to its opposite meaning. Determine the meaning of each word and then write a sentence using each word.**

uneven: _____

unequal: _____

Name _____ Date _____

C.6.3
Main Idea

# How Are Weather Forecasts Made?

**Main Idea** Scientists gather data about temperature, humidity, wind, and air pressure. They use this information to develop weather forecasts.

- Weather involves different variables, including temperature, humidity, wind, and air pressure, interacting in the atmosphere.
- Air masses form in the troposphere and create fronts where they meet, along which changes in weather occur.
- Different kinds of technology are used to predict the weather, including radar, weather satellites, and weather balloons.

**A. Match the instrument to the weather variable it is used to measure.**

| | | |
|---|---|---|
| _____ | **1.** wind vane | **a.** temperature |
| _____ | **2.** barometer | **b.** wind speed |
| _____ | **3.** thermometer | **c.** wind direction |
| _____ | **4.** anemometer | **d.** air pressure |

**B. Answer the questions to tell about air masses and fronts.**

**1.** What factor affects the temperature and moisture of an air mass?

_____

_____

**2.** What are the four main types of air masses that affect weather in North America?

_____

_____

**3.** How do air masses affect weather?

_____

_____

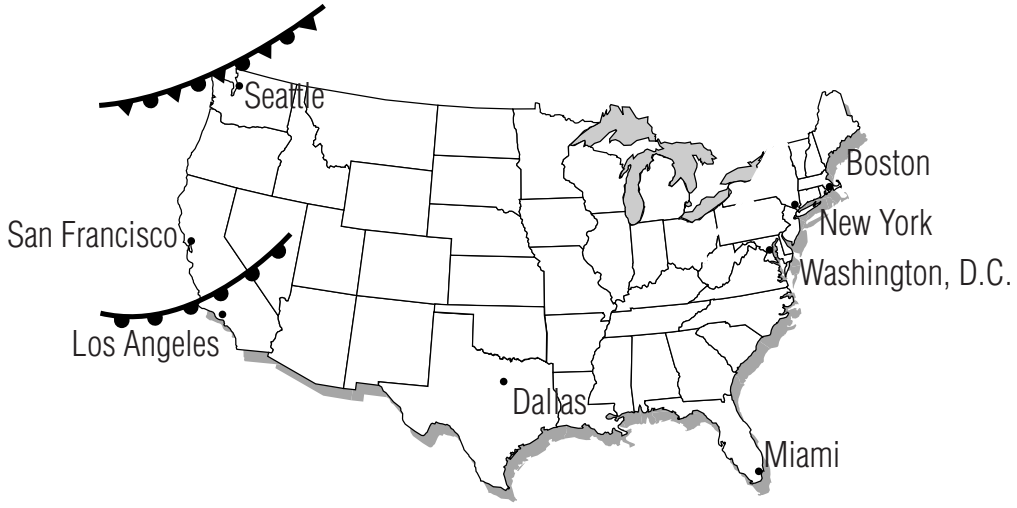
_____

Name _____ Date _____

C.6.3
Main Idea

# How Are Weather Forecasts Made?

**C. Answer the following questions about weather maps.**




**1.** A high-pressure system is pushing a cold front across the Northeast from Boston to Washington, D.C. Draw the front on the map. What kind of weather would you expect to find in New York today? Tomorrow?

_____

_____

**2.** Is it warmer in San Francisco or Los Angeles? How can you tell?

_____

_____

**D. Fill in the blanks to complete the paragraph about predicting the weather.**

_____ use different tools to study the weather. _____ is used to create images of storms using _____ that bounce off different kinds of precipitation. Weather balloons are used to study weather conditions in _____. Meteorologists then use the data they have collected to make _____ about the weather.

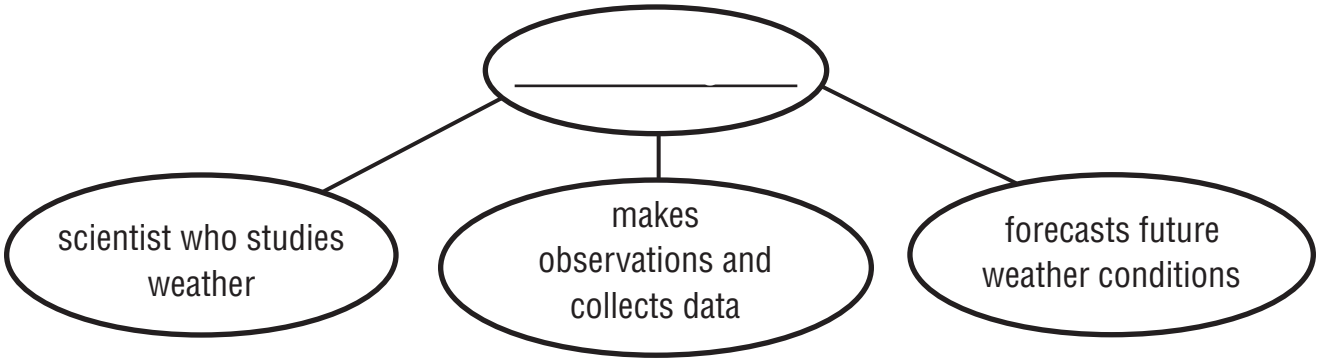
Name _____ Date _____

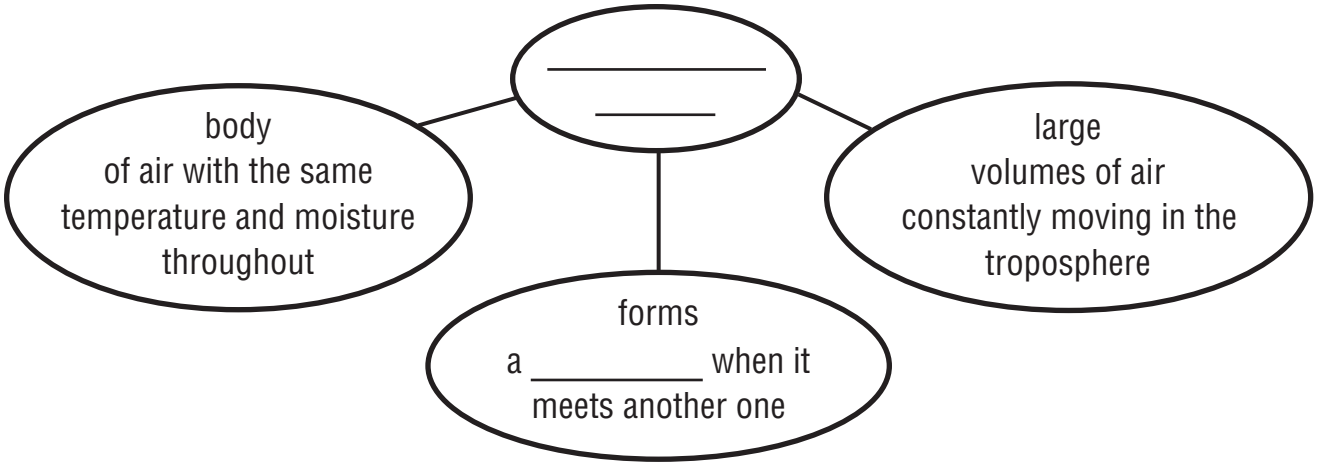


# How Are Weather Forecasts Made?

air mass front meteorologist

**Use the words from the box to complete the diagrams.**




**Vocabulary Skill: Multiple-Meaning Words**

**Many words in the English language have more than one meaning. Write two sentences that use different meanings of the word *front*.**

**1.** _____

_____

**2.** _____

_____

# How Are Weather Forecasts Made?

## Glossary

| | |
|---|---|
| **continental** | relating to a continent |
| **forecast** | prediction |
| **maritime** | located on or near the sea |
| **polar** | relating to, or near, the North Pole or the South Pole |
| **tropical** | relating to the tropics |
| **variables** | things that change or are subject to change |

**Use the words from the box to answer the following questions.**

**1.** What does the weather depend on?

_____

**2.** What kind of air mass is generally cold?

_____

**3.** What kind of air mass tends to form over water and is moist?

_____

**4.** What does a meteorologist make after gathering data about the weather?

_____

**5.** What kind of air mass is generally dry?

_____

**6.** What kind of air mass forms at low latitudes and is generally warm?

_____

Name _____ Date _____

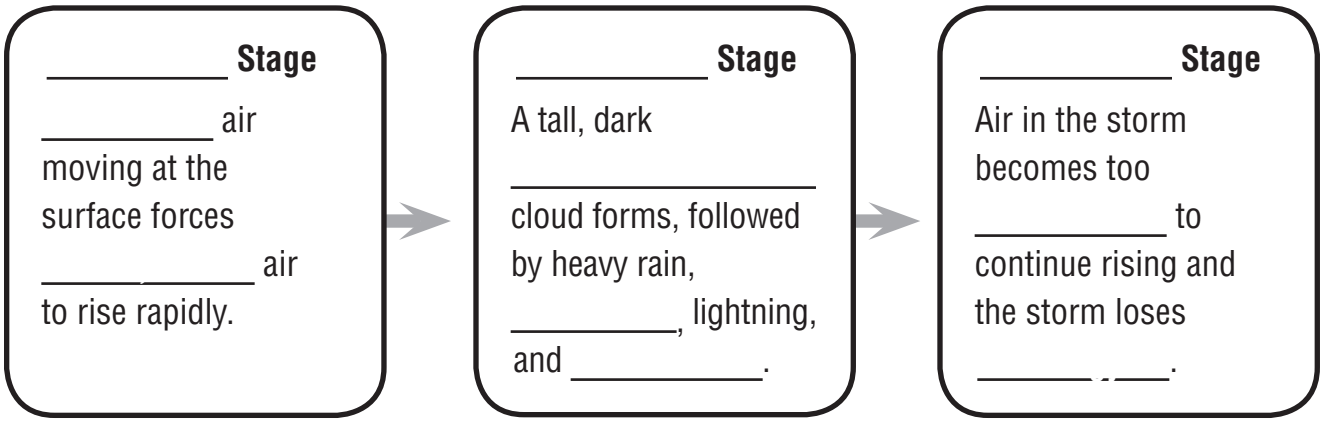
C.6.4
Main Idea

# What Causes Storms?

**Main Idea** Severe storms are associated with low-pressure systems. In these systems, warm, moist air rises and cools. Water vapor in the cooling air condenses, forming clouds followed by precipitation.

- Thunderstorms bring strong winds, heavy rains, lightning, and thunder. Tornados can develop from thunderstorms.
- Blizzards are severe snowstorms with heavy snow, high winds, and low temperatures.
- Hurricanes are the most powerful storms on Earth. They form over warm ocean waters in the tropics.

**A. Complete the diagram to tell about how thunderstorms form. Then answer the question that follows.**




What three conditions must be met for a thunderstorm to form?

_____

_____

_____

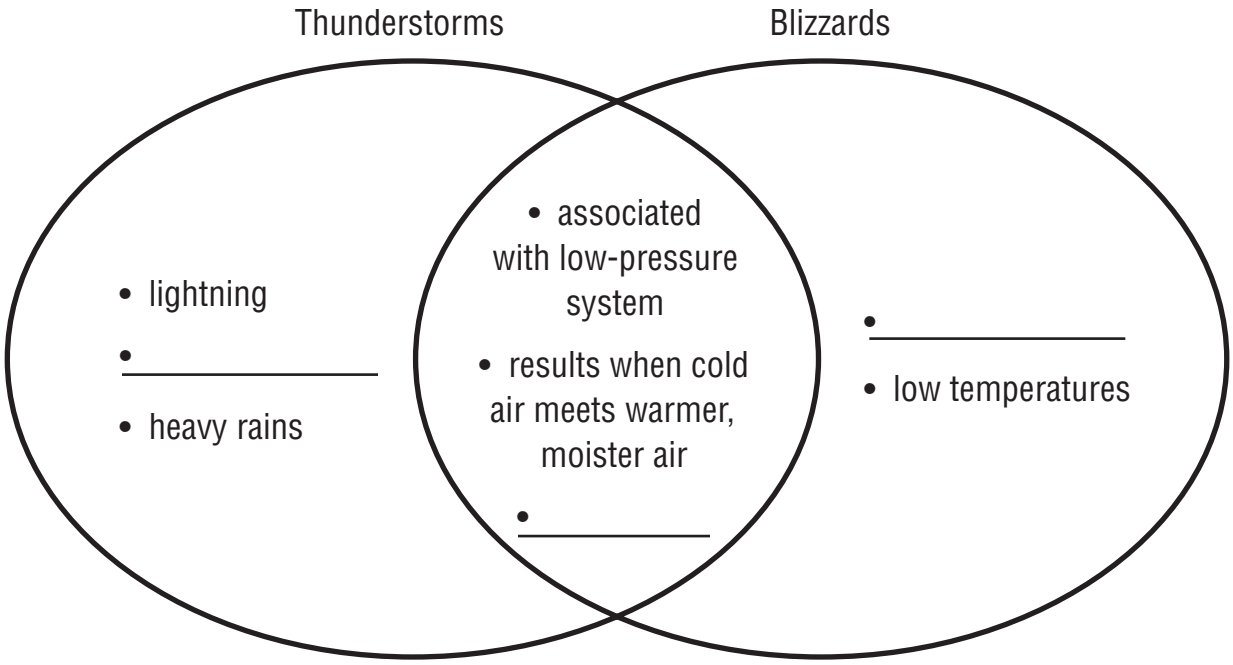
_____

Name _____ Date _____



# What Causes Storms?

**B. Complete the diagram to tell how thunderstorms and blizzards are similar and different.**




**C. Fill in the blanks to tell about the formation of a hurricane.**

**1.** A hurricane begins as a _____ _____ system over warm, tropical waters.

**2.** As the system strengthens, _____ begin to rotate around the area of low pressure.

**3.** As warm, moist air continues to rise, pressure in the center of the system _____ _____ as the storm strengthens.

**4.** The hurricane continues to grow in _____ and _____ _____ while it moves over warm, tropical waters.

**5.** The hurricane will weaken and lose energy when it moves over _____ water or moves over _____.

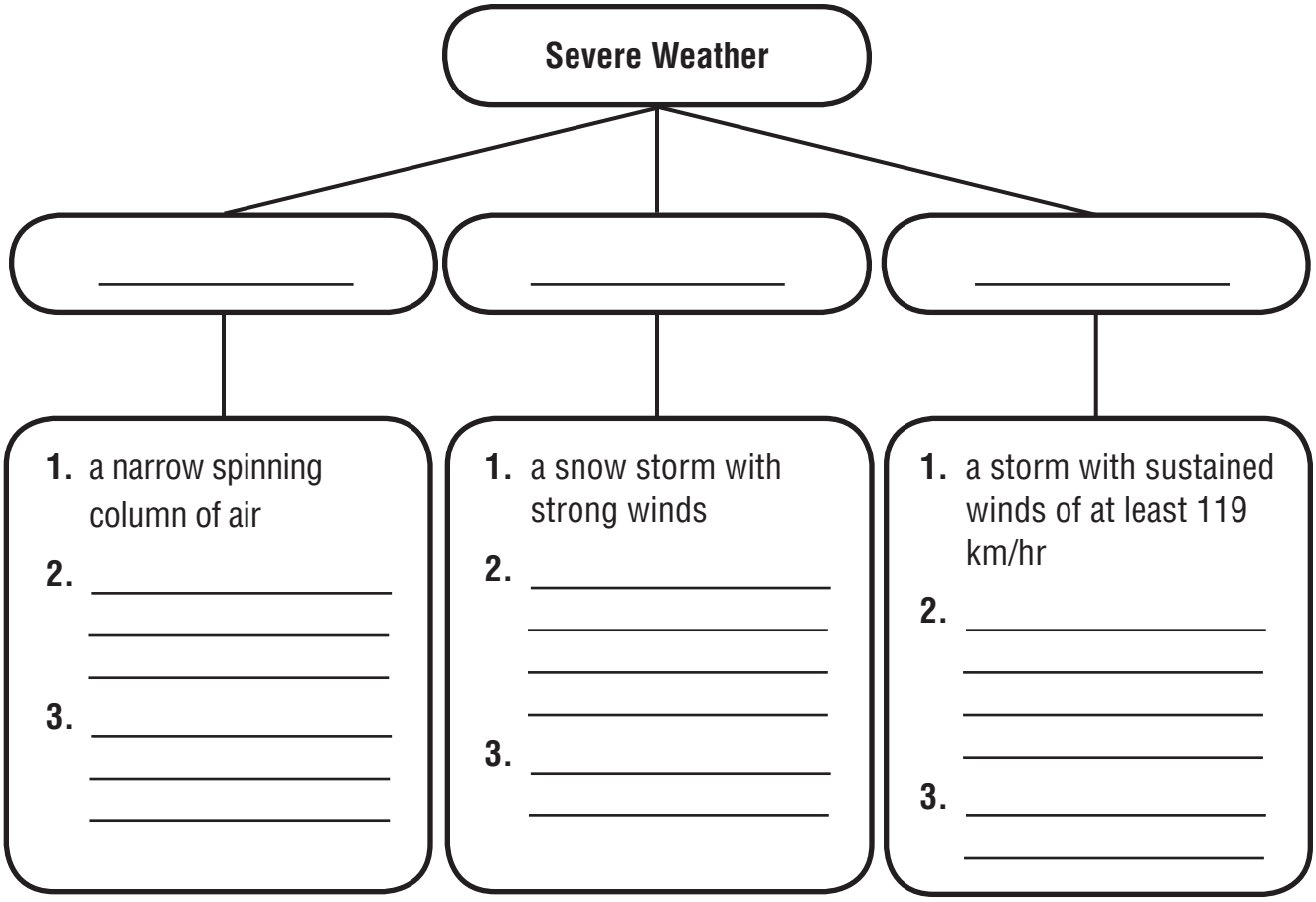
Name _____ Date _____



# What Causes Storms?

blizzard hurricane thunderstorm tornado

**Use a term from the box to complete this diagram about severe weather. Then add two more facts about each type of weather to the diagram.**




**Homework:** Write a paragraph describing how a thunderstorm forms.

# What Causes Storms?

## Glossary

| | |
|---|---|
| **condenses** | changes from a gas to a liquid |
| **discharge** | a release of electrical energy |
| **intensity** | extreme force or strength |
| **moisture** | wetness |
| **reserves** | things kept back or saved for later use |
| **visibility** | the greatest distance over which it is possible to see without aid from instruments |

**Use the words in the box to complete the following sentences.**

**1.** Clouds form when moisture in warm rising air _____.

**2.** In order for a thunderstorm to form, there must be plenty of _____ in the air.

**3.** Lightning is a powerful electric _____ _____ that can occur during a thunderstorm.

**4.** Droughts can kill crops and drain away water _____.

**5.** Moving about in a blizzard is difficult because _____ _____ is low.

**6.** A hurricane continues to grow in size and _____ _____ while over warm, tropical waters.

Name _____ Date _____



# What Is Earth's Sun Like?

**Main Idea** The Sun is the largest and most massive body in the solar system. It provides nearly all the energy needed to sustain life on Earth.

- The Sun is a medium-sized yellow star. It is the central body of the solar system.
- The Sun is made mostly of hydrogen and helium and produces energy by nuclear fusion.
- The Sun is a main sequence star. It will eventually pass through the phases of red giant, planetary nebula, white dwarf, and black dwarf.

**A. Complete the outline to tell about the Sun and its surface features. Then answer the question that follows.**

I. The Sun

**A.** a medium-sized _____

**B.** located about _____ from Earth

**C.** exerts a strong _____

**D.** main source of _____ for Earth

II. The Sun's Surface Features

**A.** _____ are cooler areas on the Sun's surface that occur in 11-year cycles.

**B.** _____ are powerful eruptions of particles on the Sun's surface.

**C.** _____ are fast-moving gases that can travel in space.

**D.** _____ are huge arcs of gas that extend high into the Sun's atmosphere.

Why do solar flares and prominences occur in 11-year cycles?

_____

_____

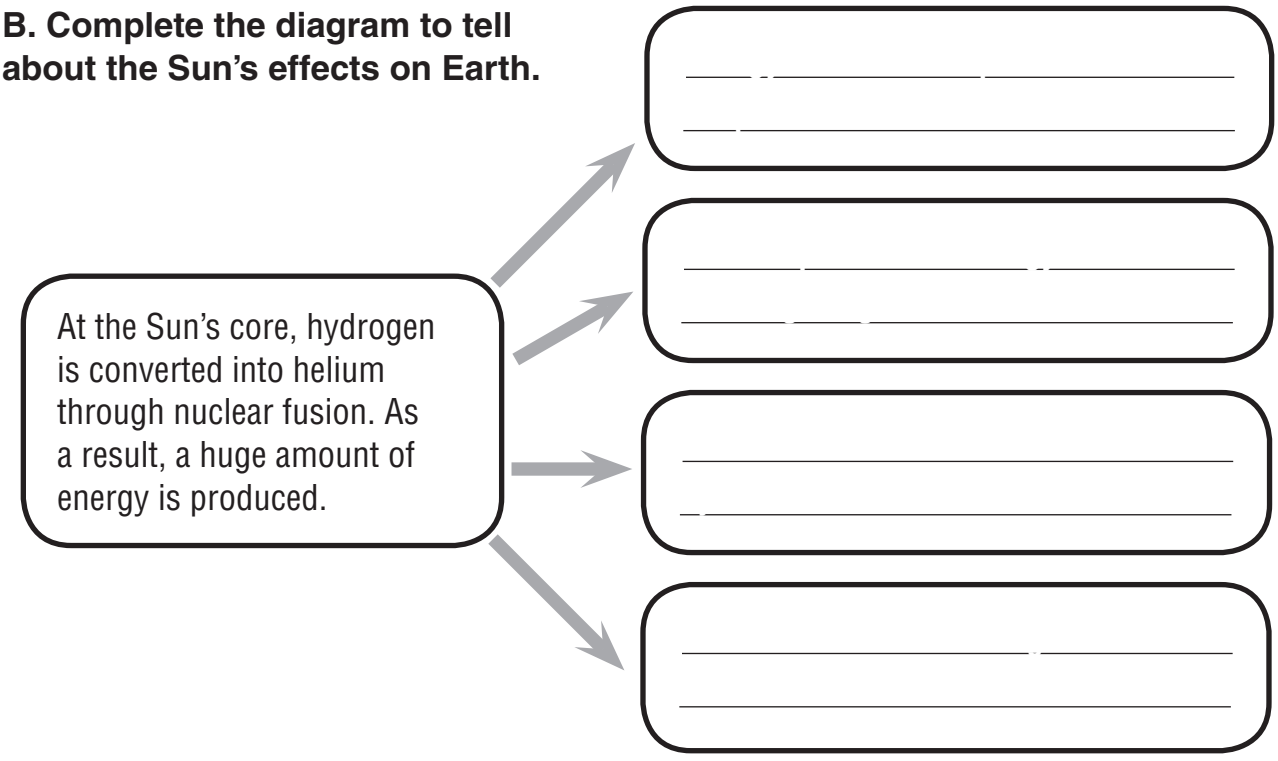
_____

Name _____ Date _____

C.7.1
Main Idea

# What Is Earth's Sun Like?

**B. Complete the diagram to tell about the Sun's effects on Earth.**




**C. Fill in the blanks to tell about the life cycle of a star. Then number the statements to show the correct sequence.**

_____ Over time, the star shrinks into a _____.

_____ The outer part of the star expands over time, while the core contracts. The star is known as a _____ _____.

_____ Out of nuclear fuel, the star eventually fades into a _____.

_____ A star forms from rotating clouds of dust and gas called a _____.

_____ A __ _____ _____ forms when the outer layers of the star are released.

_____ Nuclear fusion begins when temperatures reach 10 million °C and a _____ is born.

_____ In a _____ _____, gravity and other forces cause the nebula to collapse. Clouds begin to glow as the temperature rises.

Name _____ Date _____

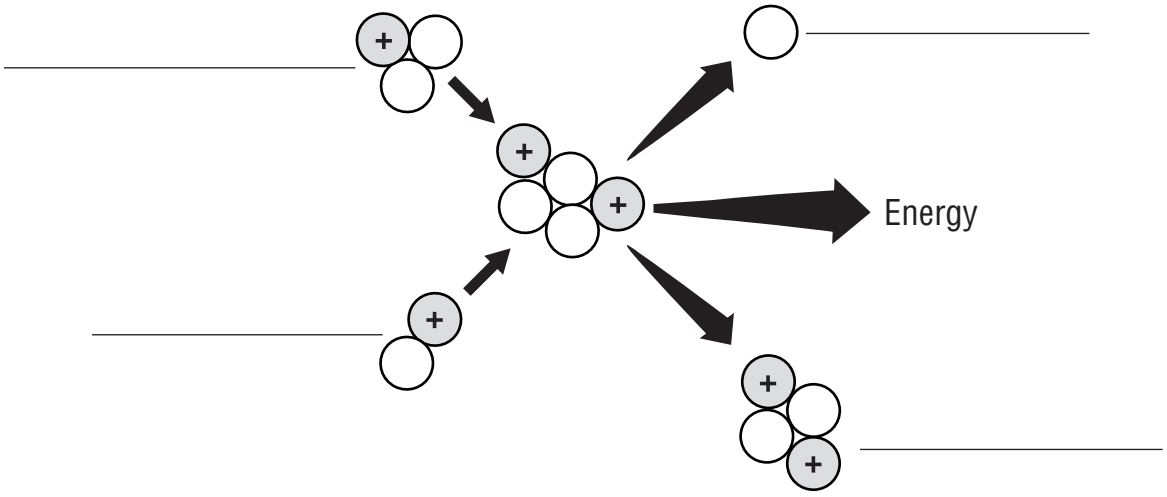


# What Is Earth's Sun Like?

nuclear fusion  sunspots

**A. Complete the paragraph to tell about stars. Then label the diagram.**

The Sun is the central body of the solar system. Like all _____, the Sun produces energy by _____. In this process, the nuclei of two forms of _____ (tritium and deuterium) fuse, or combine, to form a helium nucleus and a neutron. A tremendous amount of _____ is produced in this process from a small amount of _____ .




**B. Complete the sentences to tell about sunspots.**

1. Sunspots are _____.
2. They appear dark because _____.
3. Sunspots occur in cycles that _____.
4. Periods of low and high sunspot activity correspond to _____ .

# What Is Earth's Sun Like?

**Glossary**

| | |
|---|---|
| **collapse** | to fall downward or inward suddenly |
| **correspond** | to match |
| **disrupt** | to throw into confusion or disorder |
| **evaporate** | to change from a liquid to a gas |
| **stabilized** | kept from changing |

**Use the words from the box to complete the paragraph about the Sun.**

All stars form from enormous rotating clouds of dust and gases. Over time, gravity and other forces cause the clouds to _____ into a very dense mass. When temperatures in this dense mass reach at least 10 million °C, nuclear fusion begins. A star is born. When a newly formed star has _____, it becomes a main–sequence star, like the Sun.

The Sun affects life on Earth. Sunspots are dark areas on the Sun's surface. Periods of low and high sunspot activity _____ _____ to temperature changes on Earth. Solar flares are powerful eruptions of particles that shoot into space. When particles released in solar flares reach Earth, they can _____ _____ radio communications. In addition, the Sun drives the water cycle. It causes water on Earth's surface to _____ _____, forming water vapor.

**Vocabulary Skill: Antonyms**

**An antonym is a word that means the opposite of another word. Find an antonym for these words. Use the text from the lesson to help you.**

evaporate: _____

contract: _____

Name _____ Date _____



# What Orbits the Sun?

**Main Idea** The Sun and the bodies that revolve around it make up the solar system. The solar system is a small part of a much larger system called the Milky Way galaxy.

- The solar system consists of the Sun, nine planets, their moons, and many other smaller bodies that orbit the Sun.
- All but two planets in the solar system have at least one moon. Moons and asteroids are among the smaller bodies in the solar system.
- Comets may have short-period or long-period orbits around the Sun. Meteors are bits of matter that burn up when they enter Earth's atmosphere.

**A. Complete the summary about the formation of the solar system.**

Scientists think that the solar system is about _____ old. It formed from a hot, spinning cloud of _____. Over time, _____ caused the center of the cloud to collapse. _____ built up in the center and _____ was formed.

Away from the center, temperatures were much _____. Matter there began to come together to form _____ and their _____. Planets closest to _____ formed from heavy, _____ _____ material. Planets farther away were able to hold onto lighter _____ and became much _____. Along with the planets and their moons, other smaller bodies formed, such as _____, _____, and _____.

The paths, or _____, of all these bodies are shaped like slightly flattened circles, called _____. The strong _____ force of the Sun holds all the objects in the solar system in their orbits.

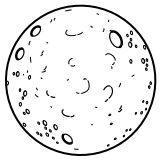
Name _____ Date _____



# What Orbits the Sun?

**B. Fill in the blanks to tell about moons, asteroids, comets, and meteors.**

## Moons

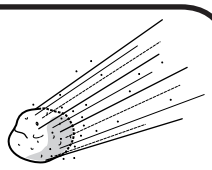


1. natural satellite
2. held in _____ by their planets
3. some have _____ _____
4. others show evidence of _____

## Asteroids

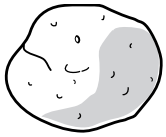
1. small, rocky objects that orbit the Sun
2. most orbit in _____ between _____
3. range widely in _____

## Comets



1. made up of dust, ice, and frozen gas
2. contain a _____ called the nucleus
3. gases and dust released from the nucleus when close to _____, forming a _____ called a coma
4. form a _____ that can reach out millions of kilometers into space

## Meteors



1. begin as chunks of rock and metal called meteoroids
2. enter Earth's _____ _____ and are heated by _____
3. _____ _____ as they fall to Earth, appearing as streaks of _____ _____ in the night sky

Name _____ Date _____



# What Orbits the Sun?

| | | | |
|---|---|---|---|
| asteroid | comet | galaxy | meteor |
| meteoroid | planet | solar system | |

**Vocabulary Skill:**
**Sentence Context**

**Use a word from the box to complete each sentence.**
**Use context clues to help you.**

**1.** A(n) _____ is a chunk of matter that is heated by friction with air as it falls through Earth's atmosphere.

**2.** A(n) _____ is a small body made up of dust, ice, and frozen gases.

**3.** A(n) _____ _____ is a large body that revolves around the Sun.

**4.** A(n) _____ is a chunk of rock or metal that can sometimes fall into Earth's atmosphere.

**5.** A(n) _____ is a small, rocky object that orbits the Sun.

**6.** A(n) _____ _____ _____ is a huge system of gas, dust, and stars.

**7.** The _____ _____ is the Sun and all the bodies that travel around it.

**Homework:** Write a paragraph that includes five facts about the objects in the solar system.

Name _____ Date _____

# What Orbits the Sun?

## Glossary

| | |
|---|---|
| **collided** | bumped together violently |
| **orbit** | to move around another object |
| **revolves** | orbits around a central point |
| **rotates** | turns around on an axis |
| **vaporize** | to change from a liquid to a gas |

**Use the words in the box to complete each sentence about objects in the solar system.**

1. The Moon _____ on its axis and _____ around Earth.

2. Some scientists believe that asteroids are remnants of several planets that _____ and broke apart.

3. When a comet approaches the Sun, frozen solids in its nucleus _____.

4. Meteors begin as meteoroids, which are bits of rock or metal that _____ the Sun.

**Vocabulary Skill: Suffixes**

**The suffix *-tion* changes a word to noun form. For each word, write its noun form using *-tion* and then write a definition for the word. Use a dictionary to help you.**

revolve: _____

rotate: _____

Name _____ Date _____

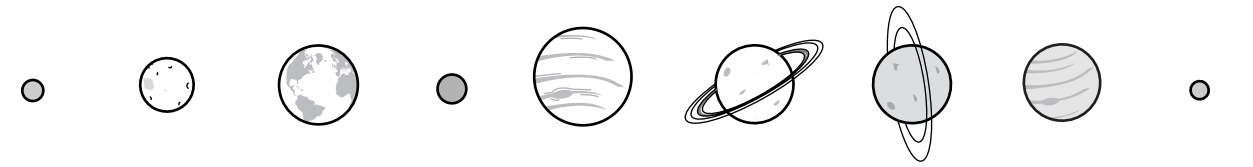


# What Are the Planets Like?

**Main Idea** The four planets closest to the Sun are called the inner planets. The remaining five planets are the outer planets.

- Mercury, Venus, Earth, and Mars are the inner planets. They are small and rocky and have few or no moons.
- Jupiter, Saturn, Uranus, Neptune, and Pluto are the outer planets. With the exception of Pluto, the outer planets are large and gaseous, and have many moons.
- Space probes can be used to explore regions of space that are too difficult or dangerous for humans to explore.

**A. Write the letter of each description under the planet it describes.**



| Mercury | Venus | Earth | Mars | Jupiter | Saturn | Uranus | Neptune | Pluto |
|---|---|---|---|---|---|---|---|---|
| ____ | ____ | ____ | ____ | ____ | ____ | ____ | ____ | ____ |

**a.** a large planet best known for it rings of ice particles

**b.** unlike other outer planets, this planet is small, rocky, and icy

**c.** a planet with a thick atmosphere made mostly of carbon dioxide

**e.** a planet with 11 moons and the coldest surface temperature

**f.** the smallest inner planet, with surface temperatures that vary widely

**g.** the only planet known to have liquid water

**h.** a planet famous for its Great Red Spot

**i.** a planet home to the largest volcano in the solar system

**j.** a planet tilted sharply on its axis with a system of 11 rings

# What Are the Planets Like?

**B. Rewrite each statement comparing the inner and outer planets to make it true.**

**1.** The inner planets are large and gaseous, while the outer planets are small and rocky.

_____

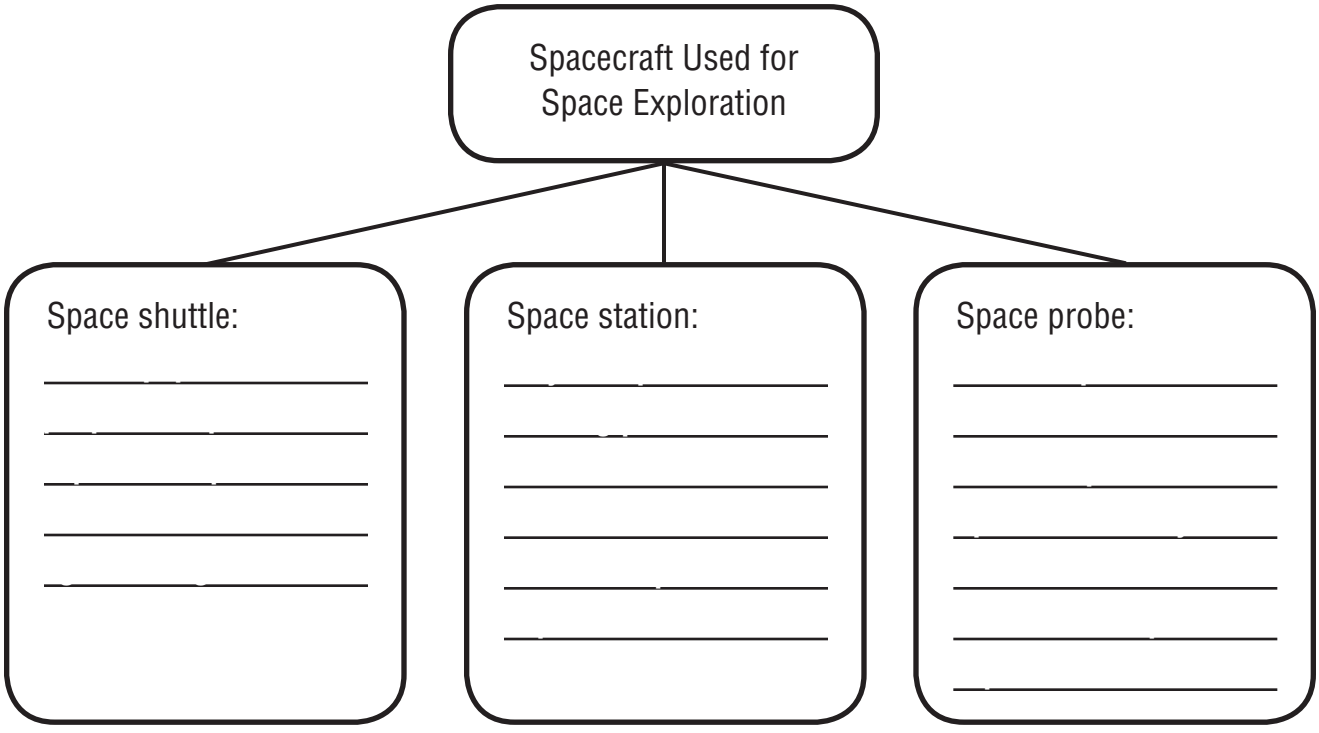
_____

**2.** The outer planets generally have fewer moons than the inner planets.

_____

_____

**C. Complete the diagram to tell about the three types of spacecraft used by astronomers to explore space.**



Name _____ Date _____



# What Are the Planets Like?

inner planet outer planet

**Answer the questions to tell about inner planets and outer planets.**

**1.** Which planets make up the inner planets?

_____

**2.** What is the relative size of the inner planets?

_____

**3.** Of what substance are the inner planets mostly composed?

_____

**4.** Which planets make up the outer planets?

_____

_____

**5.** What is the relative size of the outer planets?

_____

_____

**6.** Of what substance are the outer planets mostly composed?

_____

_____

**Homework:** Write one paragraph describing the characteristics of an inner planet and one paragraph describing an outer planet.

# What Are the Planets Like?

## Glossary

| | |
|---|---|
| **cratered** | having a surface covered with shallow holes |
| **dense** | having relatively high density |
| **erosion** | the movement of rock material from one place to another |
| **greenhouse effect** | the trapping of the Sun's radiation in a planet's atmosphere |
| **plane** | a flat or level surface |
| **velocities** | speeds |

**Use words from the box to complete the chart about the planets.**

| Planet | Characteristic |
|---|---|
| Mercury | has a heavily _____ surface, caused by collisions with other objects in space |
| Venus | atmosphere is 96 percent carbon dioxide, creating tremendous pressure and a strong ___ _____ |
| Mars | its surface shows sign of water _____, indicating that it may once have been more like Earth |
| Saturn | the least _____ of any planet |
| Neptune | its winds reach _____ of 2,700 km/hr |
| Uranus | its axis is tilted so much that it is nearly parallel to the _____ _____ of its orbit |

**Homework:** Write a paragraph that describes interesting characteristics of Earth, Jupiter, and Pluto.

Name _____ Date _____

C.7.4
Main Idea

# What Keeps Planets in Their Orbits?

**Main Idea** The path of a planet around the Sun is caused by the gravitational attraction between the Sun and the planet.

- Gravitation causes objects to fall back to Earth. The strength of the gravitational force depends on the mass of the objects and the distance between them.
- The solar system formed from a cloud of dust and gas called a nebula.
- Planets orbit in curved paths because the forward motion of the planet is balanced by the downward pull of the Sun's gravity.

**A. Answer the following questions to tell about gravitational forces.**

**1.** What is gravitation?

_____

_____

**2.** Why is gravitation an example of a non-contact force?

_____

_____

**3.** What two factors affect gravitational force?

_____

_____

**4.** What effect does mass have on the strength of a gravitational force?

_____

_____

**5.** What effect does distance have on the strength of a gravitational force?

_____

_____

Name _____ Date _____

C.7.4
Main Idea

# What Keeps Planets in Their Orbits?

**B. Complete the diagram to tell about the formation of the solar system.**

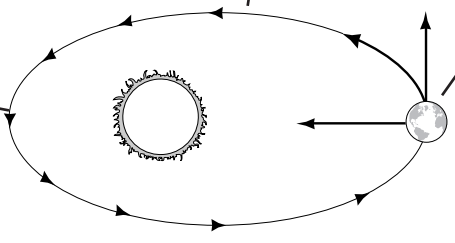
The solar system began as a _____ of gas and dust called a _____. The force of _____ collapsed the center of this cloud into a star, which became _____ .

The inner planets formed near the Sun, where _____ were very _____ . Lighter elements were _____ by the intense heat, which is why the inner planets are composed mainly of _____.

The outer planets formed _____ from the Sun, where temperatures were _____. They formed from _____ , gas, and dust. They grew in _____ until even the light elements could not escape their _____. This is why the outer planets are made mostly of light elements.

**C. Complete the diagram to tell about the orbits of planets around the Sun.**

**1.** A planet travels in an _____ _____ path around the Sun.



**2.** The _____ motion of the planet balances the Sun's _____ on it, so the planet follows a _____ path around the Sun.

**3.** The planet _____ as it nears the Sun and _____ when it is farther away.

Name _____ Date _____



# What Keeps Planets in Their Orbits?

gravity

**Place a check mark next to all the statements that are true about gravity.**

_____ **1.** It is an attractive force between objects that have mass.

_____ **2.** It is considered a contact force because it acts on objects directly.

_____ **3.** It is a force that causes an object to fall to the ground when dropped.

_____ **4.** It is generally the name for the attraction by Earth on objects at or near its surface.

_____ **5.** It affects the weight of an object.

_____ **6.** It causes objects to slow down as they fall.

_____ **7.** It played a large role in the formation of the solar system.

_____ **8.** It is a very weak force on the surface of Earth.

**Homework:** Imagine that you are standing on a balcony four stories above the ground holding a tennis ball. Using what you have learned in this lesson, write a paragraph that describes what happens to the ball when you drop it off the balcony.

# What Keeps Planets in Their Orbits?

## Glossary

| | |
|---|---|
| **attraction** | the act or power of attracting |
| **mass** | a measure of the amount of matter in an object |
| **proportional** | corresponding in size or amount |
| **resistance** | a force that tends to oppose or slow motion |
| **sensation** | a feeling or awareness |

**Use the words from the box to complete the following sentences.**

1. Gravitation is a force between objects that have _____.
2. Gravitational force is directly _____ to the product of the masses of the object.
3. The gravitational _____ by Earth on or near its surface is usually called gravity.
4. If you are falling, and your surroundings are falling at the same rate, you can experience a _____ called weightlessness.
5. Air _____, or drag, slows the acceleration of falling objects.

**Homework:** Use terms you have learned in this lesson to write a paragraph explaining why the planets in the solar system orbit the Sun.

Name _____ Date _____

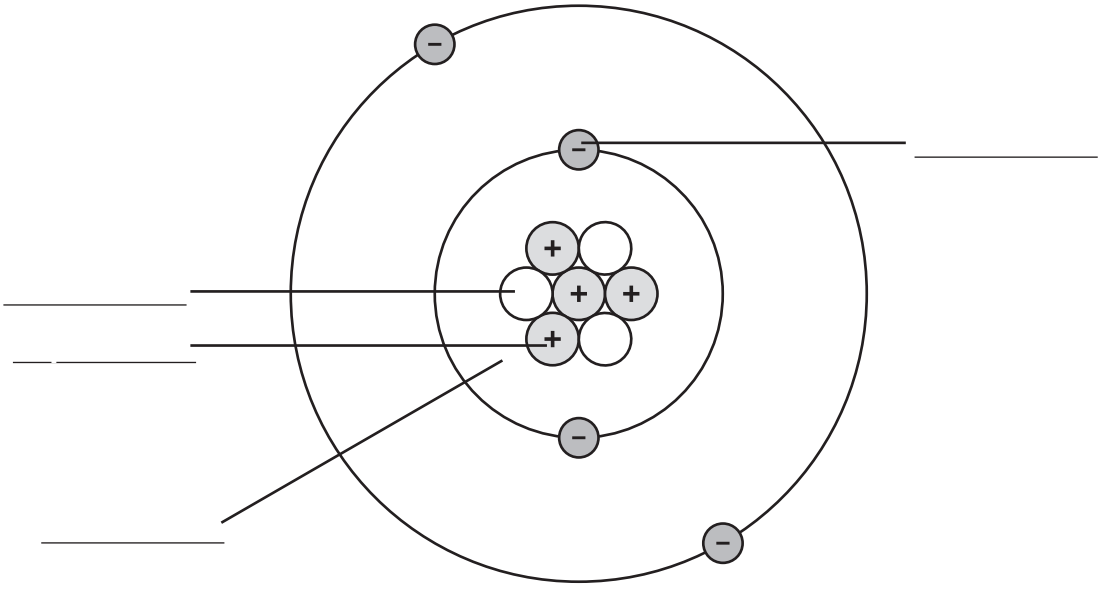


# What Are Atoms and Elements?

**Main Idea** All matter is made up of particles called atoms, the smallest units of elements. As new tools can picture, atoms often form well-ordered patterns, or arrays.

- An atom has at its center a nucleus, which is surrounded by moving electrons.
- An element has only one kind of atom. An element's properties are determined by the way those atoms join together.
- While a few elements are found in pure form, most elements form compounds with other elements.

**A. Complete the diagram by labeling the parts of an atom.**




**B. Complete each sentence to tell about matter.**

**1.** All matter is made up of _____.

**2.** Elements are made up of _____ _____.

**3.** An atom is the _____ _____ of an element.

**4.** The nucleus is the structure in _____.

**5.** The nucleus contains two kinds of particles: _ _____.

**6.** Moving in the space around the nucleus are _____.



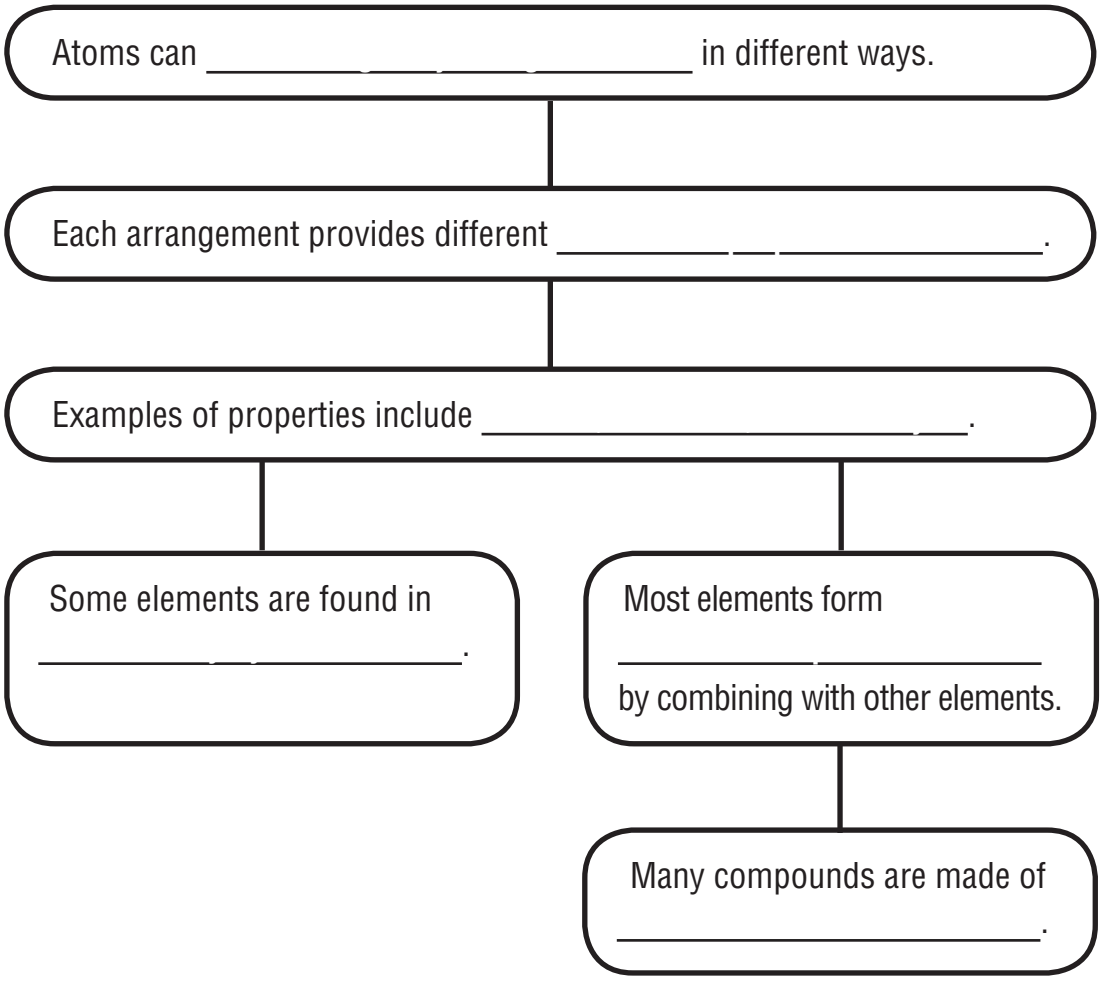

Use with pages 286–293

Name _____ Date _____



# What Are Atoms and Elements?

**C. Complete the diagram about the organization of atoms.**




**D. Put a check next to each description of a scanning tunneling microscope that is true.**

_____ uses lenses and light to magnify images

_____ was invented before the electron microscope

_____ fits on a table top

_____ shows an individual atom

_____ shows how atoms group together in arrays

_____ tells scientists everything about atoms

Name _____ Date _____



# What Are Atoms and Elements?

| | | | |
|---|---|---|---|
| atom | electron | neutron | proton |
| compound | element | nucleus | |

**Write each word from the box next to its definition. Some words will be used more than once.**

_____ a particle that lacks charge

_____ a pure substance that is made up of two or more elements that are chemically combined

_____ the smallest particle of an element

_____ the structure in the center of an atom

_____ a negatively charged particle

_____ a substance that cannot be broken apart chemically into other substances

_____ a positively charged particle

_____ contains two types of particles

_____ made up of only one kind of atom

_____ moves in space around the nucleus

_____ has a mass that is about equal to the mass of a proton

**Vocabulary Skill: Word Origins**

The word *neutron* is based on the Latin word *neuter,* which means "neither." How can this information help you remember the meaning of *neutron*?

_____

_____

# What Are Atoms and Elements?

## Glossary

| | |
|---|---|
| **aluminum** | a very lightweight, silver-white metallic element |
| **carbon** | a very common nonmetallic element that occurs in combination with other elements in every living thing |
| **copper** | a tough, reddish–brown metallic element that resists rust |
| **helium** | a very light, colorless, odorless gas that will not burn |
| **silver** | a shiny, white, precious metallic element that conducts heat and electricity better than any other substance |

**Place each word from the box in the correct category in the chart. Then answer the question that follows.**

| Metal | Nonmetal |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

The elements you sorted into different groups have different properties. What is the cause of these different properties?

_____

_____

_____

**Homework:** Use toothpicks and balls made of molded clay to construct a model of either graphite or diamond (see page 290). Then write a description of the model.

Name _____ Date _____



# What Is the Periodic Table?

**Main Idea** Scientists have identified more than 100 elements, including metals, semimetals, and nonmetals. The elements are organized in the periodic table.

- The first periodic table was created by Dmitri Mendeleyev.
- The properties of an element determine its placement on the periodic table.
- The standardized periodic table has three categories: metals, semimetals, and nonmetals.

**A. Complete the diagram to tell about the history of the periodic table.**

Around _____, the Greek philosopher Empedocles suggested that all matter is made up of four elements—_____.

↓

In _____, English chemist Robert Boyle argued that earth, air, fire, and water _____.

↓

In _____, French chemist Antoine-Laurent Lavoisier made one of the first modern _____.

↓

In _____, Russian chemist Dmitri Mendeleyev developed a way to _____.

↓

The modern periodic table is a table in which the elements are arranged by _____.

Name _____ Date _____



# What Is the Periodic Table?

**B. Rewrite each statement about the periodic table to make it true.**

**1.** Elements are arranged alphabetically.

_____

**2.** An element's atomic number is determined by its temperature.

_____

_____

**3.** Chemical symbols are the first two letters in an element's name.

_____

_____

**4.** Each column is called a period and each row is called a group.

_____

_____

**C. Use information from the periodic table on pages 300 and 301 to complete the chart below.**

| Symbol | Element | Number of Protons | Metal, Semimetal, or Nonmetal |
|---|---|---|---|
| _____ | Aluminum | _____ | metal |
| _____ | Mercury | _____ | _____ |
| _____ | Neon | _____ | _____ |
| K | _____ | _____ | _____ |
| _____ | Silicon | _____ | _____ |
| _____ | _____ | 11 | metal |

Name _____ Date _____



# What Is the Periodic Table?

| | | |
|---|---|---|
| chemical symbol | noble gas | periodic table |
| metal | nonmetal | semimetal |

**Use pages 300 and 301 in your book and the words from the box to complete the table.**

**_____ of the Elements**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 2 **He** Helium |
| | | | 5 **B** Boron | 6 **C** Carbon | 7 **N** Nitrogen | 8 **O** Oxygen | 9 **F** Fluorine | 10 **Ne** Neon |
| | | | 13 **Al** Aluminum | 14 **Si** Silicon | | | | 18 **Ar** Argon |
| 28 **Ni** Nickel | 29 **Cu** Copper | 30 **Zn** Zinc | 31 **Ga** Gallium | 32 **Ge** Germanium | | | | 36 **Kr** Krypton |
| 46 **Pd** Palladium | | | | | | | 53 **I** Iodine | 54 **Xe** Xenon |
| 78 **Pt** Platinum | | | | | | 84 **Po** Polonium | | 86 **Rn** Radon |

**Vocabulary Skill: Prefixes**

The prefix *non-* means "not" and the prefix *semi-* means "having some of the characteristics of." Use this information to write your own definitions of *nonmetal* and *semimetal.*

_____ _____ _____

_____

# What Is the Periodic Table?

## Glossary

| | |
|---|---|
| **brittle** | breaks easily |
| **conduct** | to transmit, to be a channel for |
| **luster** | the ability to reflect light |
| **mixture** | two or more substances combined together |
| **react** | to act chemically |
| **semiconductor** | a mineral substance that conducts electricity better than an insulator but not so well as a metal |

**Use a word from the box to complete each sentence about the properties of elements.**

1. One of the properties most metals have is _____.
2. Copper wires are used to _____ electricity.
3. Brass is a _____ of copper and zinc.
4. Under some circumstances silicon conducts electricity and at other times does not, so silicon is a _____.
5. Solid nonmetals are usually _____.
6. Oxygen can _____ with iron resulting in rust.

**Homework:** Choose an element from the periodic table. Write down everything you know about that element from the information on the periodic table.

Name _____ Date _____



# Where Are Elements Found?

**Main Idea** Most things on Earth are made of only a few elements—far fewer than the more than 100 elements that scientists have discovered.

- Only eight elements make up almost 99 percent of Earth's crust.
- A molecule is a group of two or more atoms that acts as a single unit.
- Carbon compounds are the main parts of all living things.

**A. Complete the outline to tell about rare and common elements.**

**I.** Most elements are quite rare on Earth.

**A.** For example, all of the gold that has ever been mined is not much compared to _____.

**II.** Other elements are rarer still.

**A.** Many of the elements after _____ on the periodic table exist only in _____ and only for _____.

**III.** Some elements are very common on Earth.

**A.** Nearly 99 percent of Earth's _____ is made of only 8 elements: _____.

**B.** Earth's _____ is made of 2 elements: _____.

**B. Place a check next to the elements found in living things.**

| | | |
|---|---|---|
| _____ hydrogen | _____ nitrogen | _____ carbon |
| _____ oxygen | _____ silicon | _____ aluminum |
| _____ iron | _____ calcium | _____ uranium |

Name _____ Date _____

D.8.3
Main Idea

# Where Are Elements Found?

**C. Rewrite each statement about molecules to make it true.**

**1.** Very few compounds are made of molecules.

_____

_____

**2.** A molecule is a group of two or more compounds that are chemically joined and that act as a single unit.

_____

_____

**3.** Very few molecules can be made from only a few kinds of atoms.

_____

_____

**D. Complete the chart to tell about carbon compounds.**

| Carbon Compound | Purpose | Examples |
|---|---|---|
| _____ | provide the body with energy | _____ _____ |
| _____ | _____ _____ | meat, fish, soybeans, eggs, and dairy products |
| lipids | _____ _____ | _____ _____ |
| _____ | _____ _____ | DNA |

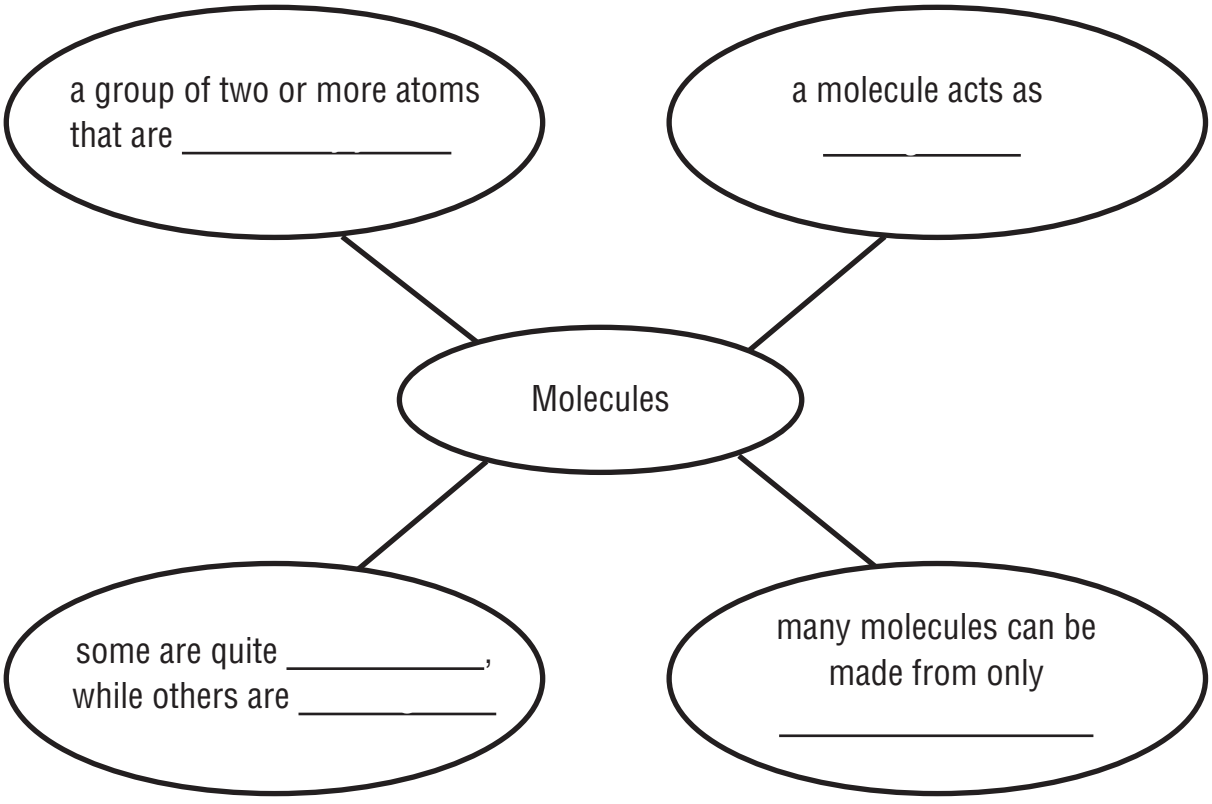
Name _____ Date _____



# Where Are Elements Found?

molecule

**Complete the diagram to tell about molecules.**




**Vocabulary Skill: Synonyms**

Synonyms are words that have similar meanings. For example, *component* and *ingredient* are synonyms for *element*. Think of a synonym for *compound* and use it in a sentence. If you substitute *compound* for the synonym, does it change the meaning of the sentence?

_____

_____

_____

_____

Name _____ Date _____



# Where Are Elements Found?

## Glossary

| | |
|---|---|
| **hydrocarbon** | any compound made of hydrogen and carbon |
| **oxygen** | a colorless, odorless gas that forms about one fifth of the air and about one third of water |
| **plastic** | a hydrocarbon |
| **polymer** | long chains of linked molecules |
| **rare** | seldom seen or found |
| **sucrose** | table sugar |

**Use the terms from the box to complete the puzzle about elements.**

### Across

**1.** DNA is an example of this

**2.** 46% of Earth's crust

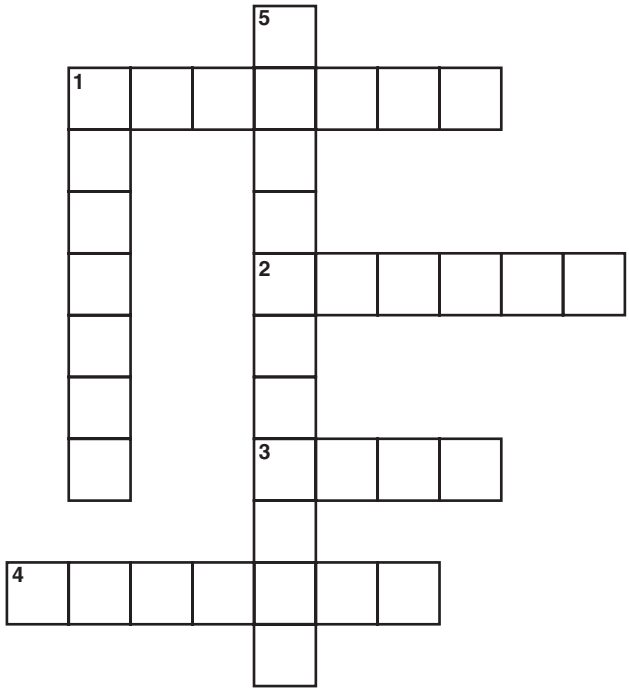
**3.** describes most of the elements

**4.** a substance with a sweet taste

### Down

**1.** an example of a hydrocarbon

**5.** made of two elements: carbon and hydrogen




**Homework:** Using the analogy of letters and words you read about on page 311 in your textbook, write a paragraph explaining how many molecules can be made from only a few kinds of atoms.

Name _____ Date _____

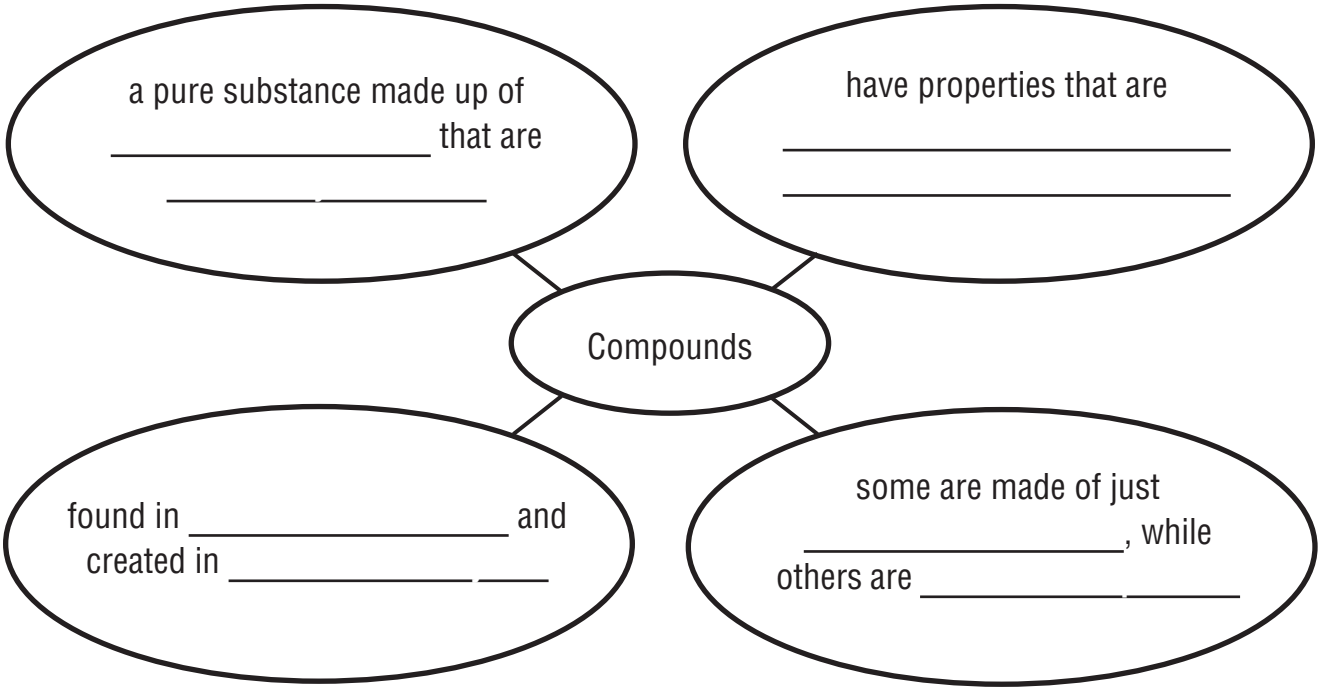


# What Are Compounds?

**Main Idea** Two or more elements can combine to form a compound. Compounds have different properties from the elements that make them up.

- The properties of a compound are different from the elements that make them up.
- Compounds are described using chemical formulas.
- Water is a unique compound that is found everywhere on Earth.

**A. Complete the diagram to tell about compounds. Then answer the question that follows.**




**What is an important factor in all chemical reactions? Explain.**

_____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____

_____ _____ _____

_____ _____

Name _____ Date _____



# What Are Compounds?

**B. Complete the sentences to tell about chemical formulas.**

1. $C_{12}H_{22}O_{11}$ is the formula for _____. It indicates that every molecule of that compound has _____ atoms of carbon, _____ atoms of hydrogen, and _____ of oxygen.
2. _____ is the formula for calcium carbonate. It indicates that every molecule of that compound has one atom of _____, one atom of _____, and three atoms of _____ _ _____.
3. _____ is the formula for iron oxide. It indicates that each _____ of that compound has _____ atoms of _____ and _____ atoms of _____ _ _____.

**C. Complete the chart to tell about common compounds.**

| Compound | Examples |
|---|---|
| carbon dioxide | _____ |
| _____ | glass, sand |
| polymers | _____ _____ _____ _____ _____ _____ _____ _____ |

**D. Place a check by each statement that is true about water.**

_____ Three-fourths of Earth's surface is water.

_____ Three-fourths of the human body is water.

_____ While water is liquid at room temperature, most compounds are not.

_____ Water dissolves more substances than any other liquid.

_____ Water molecules look like a chain of atoms.

_____ Water molecules attract each other.




Use with pages 322–331

Name _____ Date _____



# What Are Compounds?

chemical formula  chemical reaction

**Use the descriptions below to complete each diagram.**

a chemical change

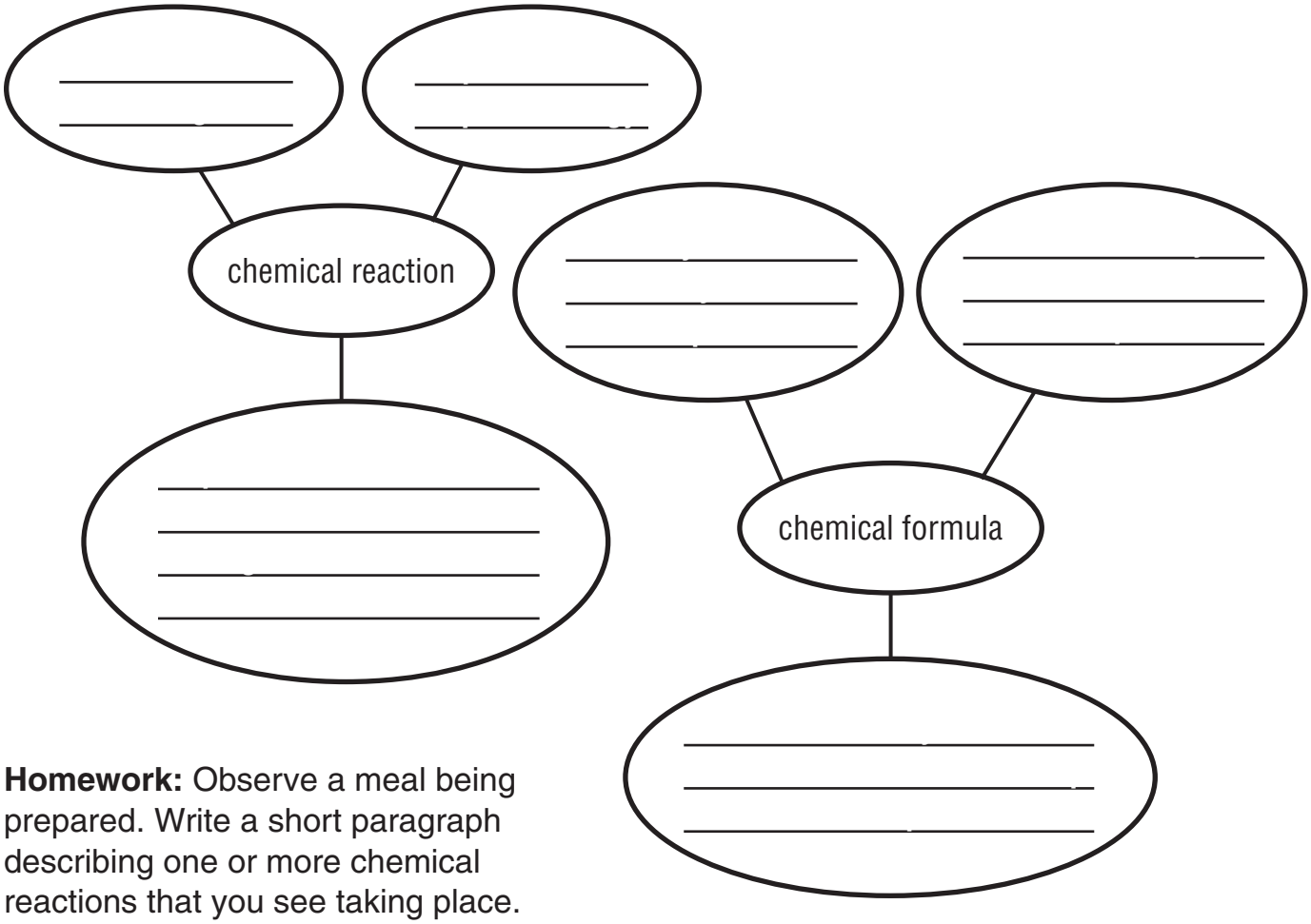
a shorthand way to describe a compound

a process in which one or more substances are changed into one or more different substances

uses chemical symbols and numbers to show the makeup of a compound

a process that requires energy

used by scientists to identify chemical compounds




**Homework:** Observe a meal being prepared. Write a short paragraph describing one or more chemical reactions that you see taking place.

Name _____ Date _____



# What Are Compounds?

## Glossary

| | |
|---|---|
| **chemical property** | how a substance reacts with other substances |
| **dissolve** | to change from a solid or gas to a liquid |
| **elements** | things that are made up of only one kind of element |
| **molecular compound** | a compound made of molecules |
| **stable compound** | a compound that does not chemically change very quickly or easily |

**Use words from the word box to complete the following sentences.**

1. Water is a _____.
2. Water is made up of two _____: hydrogen and oxygen.
3. Water has a unique _____: It is a liquid at room temperature.
4. Water is not considered a _____, because it can be chemically changed very quickly.
5. Water has the ability to _____ many compounds.

**Vocabulary Skill: Multiple-Meaning Words**

The word *current* has more than one meaning. What is the meaning of *current* in this sentence?

Scientists proved that water was a compound when they broke it into other substances by passing an electric current through it.

_____

_____

Name _____ Date _____



# What Are Some Properties of Compounds?

**Main Idea** Physical and chemical properties are characteristics used to describe, identify, and classify matter.

- A physical property can be observed without changing the matter. A chemical property is how a substance reacts with other substances.
- Solubility is the measure of how much of one substance can dissolve in another.
- The conductivity of a material is its ability to carry energy.

**A. Classify each property in the box as either a physical property or a chemical property using the chart below.**

| | |
|---|---|
| boiling point | odor |
| color | reactivity |
| conductivity | size |
| density | solubility |
| flexibility | state |
| melting point | |

| Physical Property | Chemical Property |
|---|---|
| | |




Use with pages 334–341

Name _____ Date _____

D.9.2
Main Idea

# What Are Some Properties of Compounds?

**B. Complete the outline to describe physical properties.**

**I.** Mass, volume, and density are physical properties.

**A.** Mass

**1.** Mass is a measure of _____ _____.

**2.** Mass can be measured in _____.

**B.** Volume

**1.** Volume is _____ _____ _____.

**2.** Volume can be measured in _____.

**3.** Liquid volumes are measured in _____.

**C.** Density

**1.** Density of a material is _____ _____.

**II.** Another physical property is state of matter: solid, liquid, or gas.

**A.** The melting point is _____ _____ _____ _____.

**B.** The boiling point is _____ _____ _____ _____ _____.

**III.** Solubility and conductivity are also physical properties.

**A.** Solubility

**1.** Solubility is the measure of _____ _____.

**B.** Conductivity

**1.** The conductivity of a material is _____ _____ _____ _____.

**2.** Two types of conductivity are _____ and _____.

Name _____ Date _____



# What Are Some Properties of Compounds?

| | | | |
|---|---|---|---|
| boiling point | conductivity | melting point | solubility |
| chemical property | density | physical property | |

**Circle the term in parentheses that correctly completes each statement about the properties of matter.**

1. The (boiling point, melting point) of a substance is the temperature at which it changes from a liquid to a gas.
2. The measure of how much of one substance can dissolve in another substance is called (density, solubility).
3. A characteristic that can be measured or detected by the senses is called a (chemical property, physical property).
4. The (density, conductivity) of a material is its ability to carry energy.
5. The temperature at which a solid substance changes to a liquid is called its (melting point, solubility).
6. A (chemical property, physical property) is the ability or tendency of a material to change its chemical makeup.
7. The (density, solubility) of a material is its mass per unit volume, or ratio of mass to volume.

**Vocabulary Skill: Word Parts**

The suffix *-ability* means "able to" and the root *solu-* is derived from the Latin word *solvere,* meaning "loosen." Explain how the word *solubility* is related to the meanings of its parts.

_____

_____

# What Are Some Properties of Compounds?

## Glossary

| | |
|---|---|
| **mass** | a measure of the amount of matter in an object |
| **rigid** | have a definite shape and volume |
| **state** | the physical condition of a material |
| **thermal** | of or about heat |
| **volume** | the amount of space a sample of matter takes up |

**Write each word from the box next to the clue it matches.**

_____ measured in grams or kilograms

_____ solid

_____ measured in cubic centimeters for solids

_____ liquid

_____ not changing

_____ gas

_____ warmed

**Homework:** Look around your home. Make a list of the ways plastic and rubber are used as electrical and thermal insulators. You may want to do some research on insulators in order to lengthen your list.

Name _____ Date _____



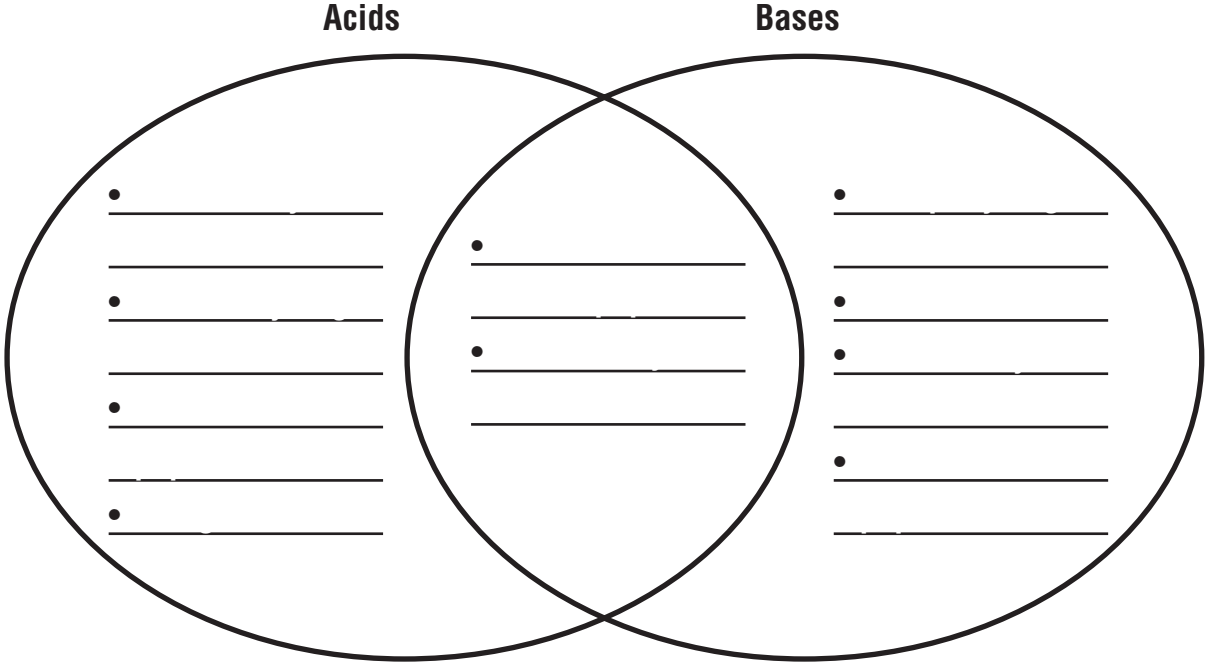
# What Are Acids, Bases, and Salts?

**Main Idea** Acids, bases, and salts are classes of compounds, each with characteristic properties. The strengths of acids and bases are measured with the pH scale.

- Acids release hydrogen ions and react easily with bases.
- Bases accept hydrogen ions and react easily with acids.
- Salts are formed when a strong acid reacts with a strong base.

**A. Use the items below to complete the diagram to compare and contrast acids and bases.**

| | |
|---|---|
| accept hydrogen ions | react easily with acids |
| bleach | release hydrogen ions |
| react to litmus paper | turn blue litmus paper red |
| react easily with other substances | turn red litmus paper blue |
| react easily with bases | vinegar |



Name _____ Date _____



# What Are Acids, Bases, and Salts?

**B. Rewrite each statement about acids and bases to make it true.**

**1.** An acid typically receives hydrogen ions and a base typically releases hydrogen ions.

_____

_____

**2.** Acids and bases can be identified by mixing them with water.

_____

_____

**3.** Water is an example of an acid.

_____

_____

**4.** A value called pH stands for parts of helium.

_____

_____

**5.** Acids and bases have pH values of zero.

_____

_____

**C. Put a check next to each true statement about salts.**

_____ typically made from a metal and a nonmetal

_____ have high melting points

_____ most dissolve slowly in water

_____ found in abundance in the ocean

_____ raise the melting point of water

_____ needed by the human body

Name _____ Date _____



# What Are Acids, Bases, and Salts?

| | | |
|---|---|---|
| acid | base | indicator |
| pH | salt | |

**Write each characteristic below in the appropriate column in the chart. Then answer the question that follows.**

| | |
|---|---|
| detergents | potassium |
| fruit juices | sodium chloride |
| pH values greater than 7 | used to digest food |
| pH values less than 7 | |

| Acids | Bases | Salts |
|---|---|---|
| | | |
| | | |
| | | |

What is the purpose of an indicator?

_____

_____

_____

**Vocabulary Skill:**
**Word Derivations**

What is the origin of the word *acid?* Use a dictionary to help you.

_____

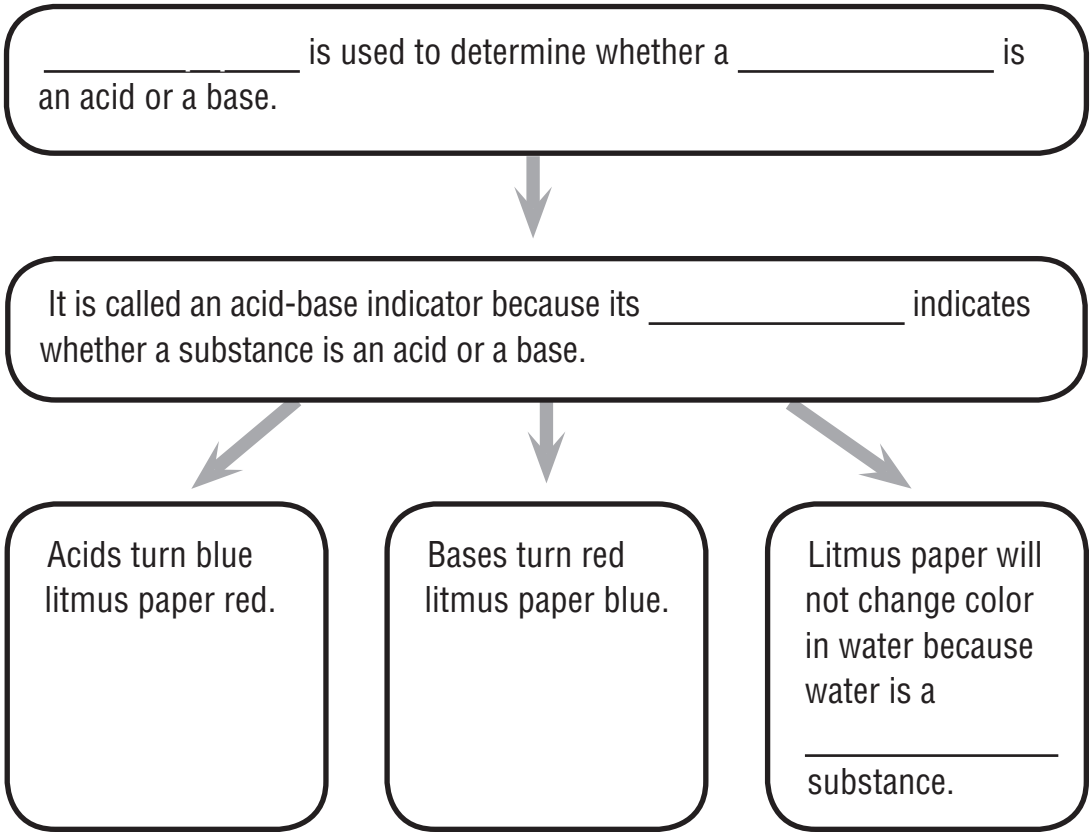
_____

# What Are Acids, Bases, and Salts?

## Glossary

| | |
|---|---|
| **litmus paper** | paper treated with litmus, a dye that changes color in the presence of acids or bases |
| **neutral** | neither one thing or the other |
| **reaction** | action in response to some influence or force |
| **substance** | a material of a particular kind or composition |

**Use the words from the box to complete the diagram.**




**Homework:** Draw a pH scale. Color the portion of the scale that would include acids red and label it. Color the portion of the scale that would include bases blue and label it. Indicate where on the scale the substance water would fit. Estimate the placement of specific acids and bases on the scale based on the descriptions of "weak" and "strong" found in this chapter.

Name _____ Date _____



# What Are the Three States of Matter?

**Main Idea** Matter can exist in three familiar states: solids, liquids, and gases. These states are determined by the motion and arrangement of particles.

- The properties of a substance's particles determine its state.
- Solids have a definite shape and volume and their particles are arranged very close together.
- Liquids have a definite volume, but no definite shape. Their particles are close together and can move about.
- Gases do not have a definite shape or volume. Their particles are spread far apart and are constantly moving.

**A. Use the descriptions from the box to complete the chart to tell about the states of matter.**

completely random
can slip past each other
closely packed
vibrate, but don't move about
always changing
spread very far apart

| | Solid | Liquid | Gas |
|---|---|---|---|
| **Particle Arrangement** | _____ | _____ | _____ |
| **Particle Movement** | _____ | _____ | _____ |

Name _____ Date _____



# What Are the Three States of Matter?

**B. Write the name of the state of matter that matches the description.**

_____ matter that has a definite volume and a definite shape

_____ _____ matter that has a definite volume, but no definite shape

_____ _____ matter that does not have a definite shape or volume

**C. Arrange the three states of matter—*solid, liquid,* and *gas*—from least compressible to most compressible.**

Least Compressible — Most Compressible

_____ _____ _____

**D. Write the terms *helium, oil,* and *wood* in the diagram. Then complete the sentence that follows to explain your reasoning.**

Least Compressible — Most Compressible

_____ _____ _____

The most compressible state of matter is _____ _____ because its particles can _____ _____.

Name _____ Date _____



# What Are the Three States of Matter?

gas liquid solid

**Place a check in the appropriate column to tell about the properties of each state of matter.**

| Matter | Definite Shape | No Definite Shape | Definite Volume | No Definite Volume |
|---|---|---|---|---|
| Solid | | | | |
| Liquid | | | | |
| Gas | | | | |

**Vocabulary Skill: Word Origins**

*Gas* is a coined, or invented, word. Use a dictionary to identify the origin of this word.

_____ _____ _____ _____ _____

_____ _____

_____ _____ _____ _____

_____ _____ _____

_____ _____

Name _____ Date _____



# What Are the Three States of Matter?

## Glossary

| | |
|---|---|
| **attraction** | act or power of gathering |
| **fluid** | any substance whose particles can flow freely |
| **state** | physical form |
| **tension** | a stretched condition |

**Use the words from the box to complete the sentences about the states of matter.**

1. A solid is one _____ of matter.
2. Water is a _____, and flows easily at room temperature.
3. Surface _____, a force of attraction among the particles at the surface of a liquid, is a property of liquids.
4. In a solid, the small forces of _____ between particles keeps them from moving from place to place.

**Homework:** Complete a chart like the one shown with examples of each of the states of matter.

**States of Matter**

| Solid | Liquid | Gas |
|---|---|---|
| | | |
| | | |
| | | |

Name _____ Date _____

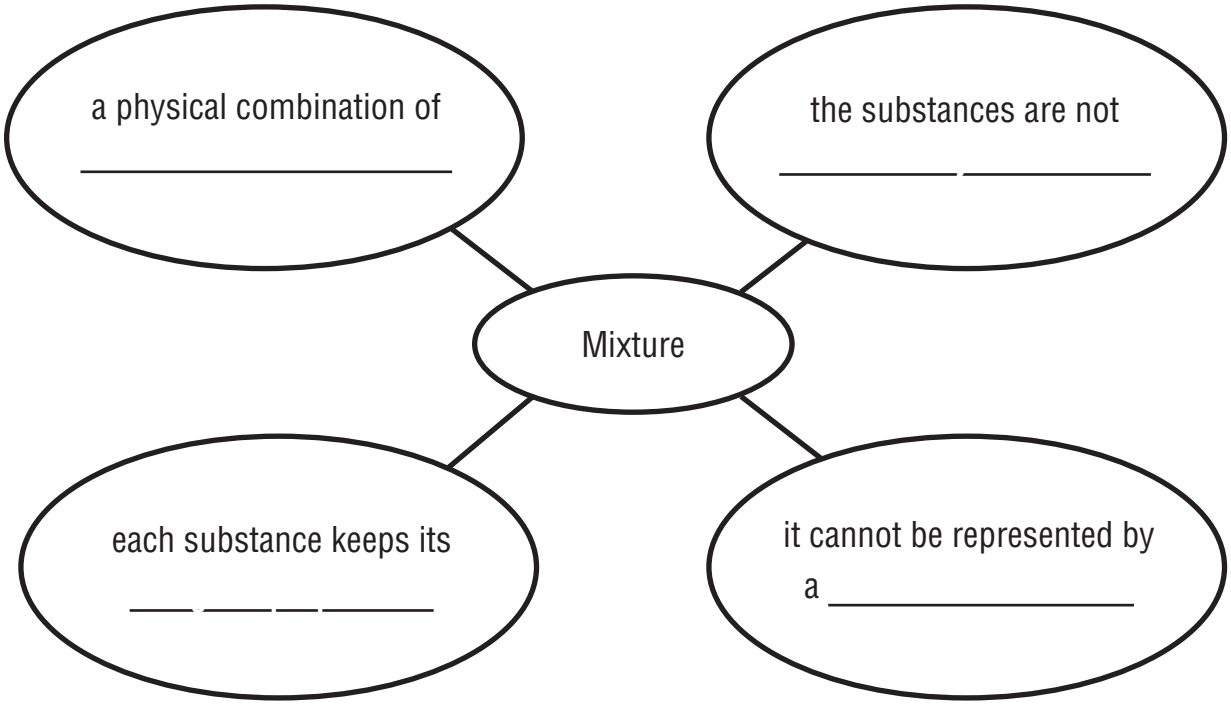


# What Are Mixtures and Solutions?

**Main Idea** In a mixture, the parts keep their physical properties. These properties can be used to separate the mixture. Mixtures that are evenly mixed at the atomic or molecular level are called solutions.

- Mixtures are physical combinations of two or more substances in which the substances are not chemically combined.
- Solutions are mixtures in which the particles are evenly mixed at the atomic or molecular level.
- Solutions can be separated by making use of the different properties of the mixed materials.
- Alloys are solutions of two or more metals or of a metal and another solid.

**A. Fill in the blanks to complete the description of a mixture.**



Name _____ Date _____



# What Are Mixtures and Solutions?

**B. Rewrite each statement about mixtures to make it true.**

**1.** In a heterogeneous mixture, two or more substances are evenly mixed.

_____

_____

**2.** In a homogeneous mixture, two or more substances are distributed unevenly.

_____

_____

**3.** In a solution, particles do not mix at the atomic or molecular level.

_____

**4.** The methods of separating a solution include filtering and condensation.

_____

_____

**C. Complete the chart to tell about alloys and their uses.**

| Alloy | A Mixture of | Used for |
|---|---|---|
| bronze | _____ | _____ |
| _____ | iron, carbon, and other solids | _____ |
| _____ | _____ | musical instruments |
| sterling silver | _____ | _____ |

Name _____ Date _____



# What Are Mixtures and Solutions?

mixture solution

**A. Use the words from the box to complete each sentence to tell about mixtures and solutions.**

1. A _____ is a homogeneous mixture of two or more substances that are evenly distributed.
2. A _____ is a physical combination of two or more substances.

**B. Classify each of the following items as a mixture or a solution.**

| | | |
|---|---|---|
| air | birdseed | pink lemonade |
| salad | salt water | sand and pebbles |
| soda water | vegetable soup | |

| Mixture | Solution |
|---|---|
| | |
| | |
| | |
| | |

**Vocabulary Skill: Root Words**

*Genus* is a Latin word meaning "type" or "kind." The prefix *hetero-* means "different" and the prefix *homo-* means "the same." Using this information, write a definition for each word.

_____

_____

_____

Name _____ Date _____



# What Are Mixtures and Solutions?

## Glossary

| | |
|---|---|
| **solute** | a substance being dissolved |
| **solvent** | a substance that dissolves the solute |

**Identify the solution, the solute, and the solvent to complete the following descriptions.**

**1.** Sugar cane juice is made up of water and sugar.

**A.** The solution is _____ _____ _____.

**B.** The solvent is _____.

**C.** The solute is _____ _____.

**2.** Salt water is made up of salt and water.

**A.** Salt water is the _____.

**B.** Water is the _____.

**C.** Salt is the _____.

**3.** Acid rain is made up of water and acids or other chemicals.

**A.** The solution is _____.

**B.** The solvent is _____.

**C.** The solute is _____.

**Homework:** Write a paragraph describing how you can separate a solution of salt water.

Name _____ Date _____



# How Does Matter Change?

**Main Idea** A chemical change involves a change in the identity of matter, whereas a physical change does not.

- Most solids will expand when heated and contract when cooled.
- A solid changes to a liquid when heated to its melting point, and a liquid changes to a solid when cooled to its freezing point.
- Vaporization, condensation, sublimation, and deposition are all physical changes.

**A. Complete each sentence to tell about changes in matter.**

**1.** A change of size, shape, or state of matter is a(n) _____.

**2.** The increase in the size of a substance due to a change in temperature is called _____.

**3.** When a solid undergoes _____, it takes up less space due to cooling.

**4.** Although heating or cooling may change the volume of matter, the _____ will stay the same.

**5.** Vaporization is the change of state from a _____ _____ to a _____ _____.

**6.** Slow or gradual vaporization is called _____ _____.

**7.** _____ is a change of state from a gas to a liquid.

**8.** The process of changing directly from a solid to a gas is called _____.

**9.** The opposite of sublimation is _____ _____.

Name _____ Date _____



# How Does Matter Change?

**B. Rewrite each statement about physical changes to make it true.**

**1.** A solid begins to change to a liquid at its freezing point.

_____

**2.** When energy is removed from a liquid, the liquid will begin to melt.

_____

_____

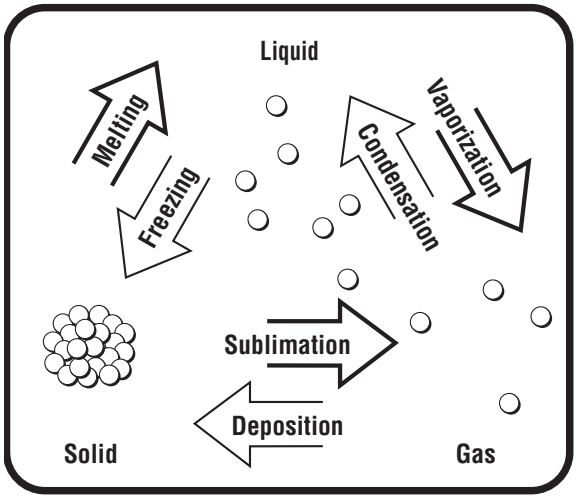
**3.** The melting point and freezing point for any substance is 0°C.

_____

_____

**C. Use the diagram below to answer the following questions about the changes in matter.**

Energy and States of Matter




**1.** What happens when energy is removed from a liquid?

_____

_____

**2.** What happens in vaporization?

_____

_____

**3.** What happens in sublimation?

_____

**4.** What happens in deposition?

_____

Name _____ Date _____



# How Does Matter Change?

| | |
|---|---|
| condensation | evaporation |
| sublimation | vaporization |

**A. Use the words from the box to complete each sentence about physical changes to matter.**

1. _____ is the change of state from a liquid to a gas.
2. _____ is the change of state from a gas to a liquid.
3. Slow or gradual vaporization is called _____.
4. The process of changing from a solid to a gas is called _____.

**B. Write each word from the box next to the statement that describes it.**

_____ water droplets forming on the outside of a glass of ice water

_____ water being heated in a tea kettle

_____ a solid changes directly into a gas

_____ there is less water in a fish tank after a week

**Vocabulary Skill: Antonyms**

Antonyms are words with opposite meanings. Find a pair of antonyms in the lesson.

_____ _____

_____ _____

Name _____ Date _____



# How Does Matter Change?

**Glossary**

| | |
|---|---|
| **contraction** | the act or process of making smaller |
| **expansion** | the act or process of making larger |
| **thermal** | of or relating to heat |
| **vibrate** | to move back and forth rapidly |

**Use the words from the box to complete the diagram to tell about physical changes. Then answer the question that follows.**

The temperature of a solid rises.

↓

Particles in the solid _____ more rapidly.

↓

The solid undergoes _____ _____.

A solid is cooled.

↓

The particles _____ more slowly.

↓

The solid undergoes _____ _____.

**Why do engineers add expansion joints to bridges in order to make them safer?**

_____

_____

_____

_____

**Homework:** Write a short paragraph explaining why ice floats. Try to use as many words from the box in your answer as you can.

Name _____ Date _____



# What Happens in a Chemical Reaction?

**Main Idea** A chemical change involves making and breaking chemical bonds to form new substances. Chemical changes can either absorb or release energy.

- A chemical change results in one or more new substances.
- Matter is neither created nor destroyed in chemical and physical changes.
- Energy is always involved in a chemical reaction.

**A. Circle the items that are examples of chemical changes.**

bananas ripening

dry ice sublimating into carbon dioxide gas

burning natural gas on a stove

frost forming on grass

lichens growing on rocks

liquid water freezing into ice

burning wood in a campfire

rust forming on a bicycle chain

**B. Put a check next to the items that are signs of a chemical change.**

_____ change in color

_____ the release of heat

_____ decrease of matter

_____ growth of living organism

_____ increase of matter

_____ release of light

Name _____ Date _____

D.10.4
Main Idea

# What Happens in a Chemical Reaction?

**C. Rewrite each statement about chemical reactions to make it true.**

1. A chemical change is a change in matter that results in a change in color.

   _____ _____ _____

   _____ _____

2. In any sample of matter, forces called reactants hold the atoms or molecules together.

   _____ _____ _____

   _____ _____

3. Scientists use ratios to describe the reactants and products of a chemical reaction.

   _____ _____

   _____ _____

**D. Circle the choice that best completes each sentence about the conservation of matter.**

1. In a physical change, the amount of matter (increases, stays the same, decreases).
2. In a chemical change, the amount of matter (increases, stays the same. decreases).
3. Regardless of the kind of change, matter is (created, conserved, destroyed).
4. The mass of materials before a chemical change is (less than, equal to, more than) the mass afterwards.
5. In a chemical reaction, the total mass of the reactants is (less than, equal to, greater than) the total mass of the products.

Name _____ Date _____



# What Happens in a Chemical Reaction?

product reactant

**A. Use the words from the box to complete each sentence to tell about products and reactants.**

1. When a substance enters into and is altered through the course of a chemical change, it is called a _____.
2. A substance that results from a chemical change is called a _____.

**B. Label the reactants and products in the following chemical equations.**

iron + oxygen → rust

_____ _____

$2H_2O \rightarrow 2H_2 + O_2$

_____ _____

**C. Using chemical formulas, write a chemical equation for the following chemical reaction. Six molecules of water and six molecules of carbon dioxide are the reactants. One molecule of sugar and six molecules of oxygen are the products.**

_____ → _____

**Homework:** Choose one of the locations listed below. Then write a paragraph describing at least three chemical reactions that could occur at that location.

- a kitchen
- a campsite
- a science laboratory

# What Happens in a Chemical Reaction?

## Glossary

| | |
|---|---|
| **breaking** | coming apart |
| **created** | brought into being; made |
| **decays** | rots |
| **destroyed** | done away with |
| **forming** | taking shape |
| **ripens** | matures; develops |

**Use the words in the box to complete the sentences about chemical changes.**

1. In any sample of matter, forces called chemical bonds hold the atoms or molecules together. Chemical changes involve _____ ___ existing bonds and _____ ____ new ones.
2. Fruit changes chemically when it either _____ _____ or _____ _____. You can use a scale to prove mass is conserved when matter changes.
3. When matter changes, mass is neither _____ nor _____ _____.

**Vocabulary Skill: Antonyms**

Antonyms are words with opposite meanings. Write the three pairs of antonyms from the box above.

_____ _____

_ _____ _____

_____ _____ _____

HOUGHTON MIFFLIN

# California Science

# Study Guide

Lesson Main Idea Worksheets

Lesson Science Vocabulary Worksheets

Lesson Support Vocabulary Worksheets

HOUGHTON MIFFLIN BOSTON

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# Contents

## Unit D Elements and Their Combinations

# To the Teacher

Use this *Study Guide* with each lesson of *Houghton Mifflin Science, California Edition.* This *Study Guide* provides a variety of activities that help students check their understanding of each lesson's main idea and practice using the lesson's vocabulary.

### *Main Idea*

Main Idea pages provide reinforcement for the core lesson content. A main idea statement is followed by three or four sentences that tell the details of the lesson's main idea. These details outline the main idea providing scaffolding for students as they complete the interactive activities and strengthen their understanding of key lesson content. These activities may also be used to review and prepare for tests.

### *Science Vocabulary*

The Science Vocabulary page of each lesson reinforces key science vocabulary words while helping students access lesson content. The key science vocabulary words are listed on the first Learn by Reading page of each lesson in the student's textbook. All of the key vocabulary words in a lesson are covered in interactive activities designed to offer meaningful practice using these science words.

### *Support Vocabulary*

The words found on the Support Vocabulary page have high general utility across the curriculum. These words are important to understanding the content of the lesson, but are not defined in the text. A glossary appears on the page for reference as students complete the activities. The Support Vocabulary page gives all students a way to work with everyday words that provide meaning for science concepts.

***Homework** activities allow students an opportunity to demonstrate their understanding of the important concepts and key science vocabulary in each chapter.*

***Vocabulary Skill** practice addresses the Vocabulary Skill presented in the Vocabulary Preview of each chapter as well as other grade-level vocabulary skills.*

Name _____ Date _____



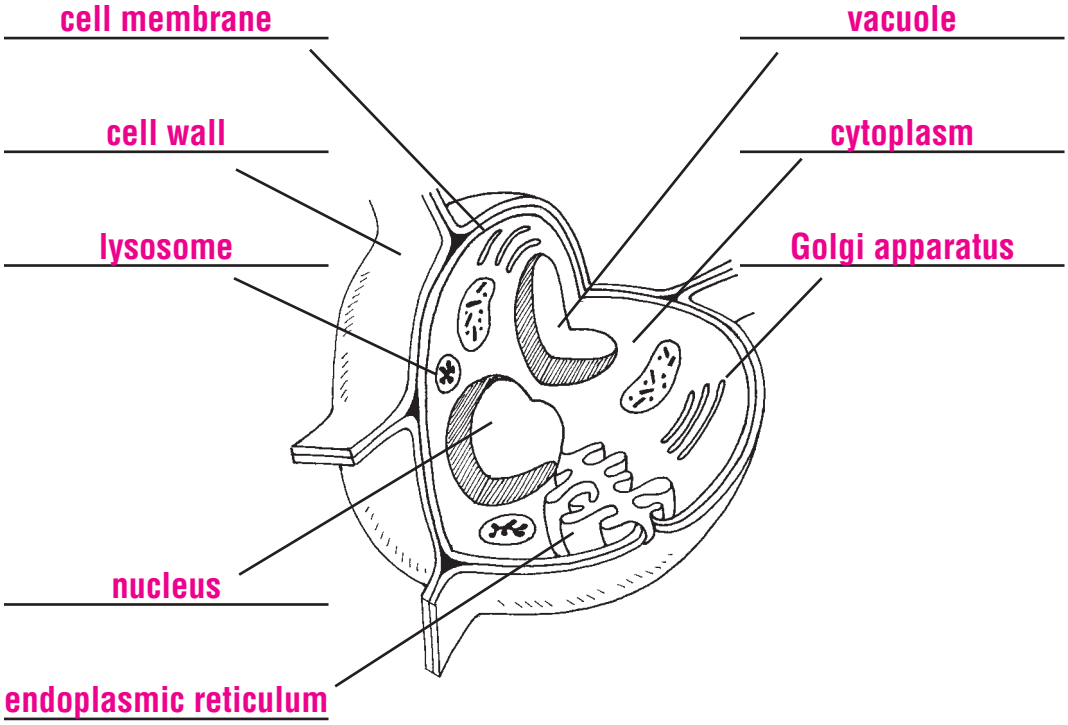
# What Are the Parts of a Cell?

**Main Idea** Cells are the basic building blocks of living things. Cells contain special structures to transport cell materials.

- All living things are made of cells. Cells are the basic unit of all living things. All cells come from other cells.
- All living things depend on cells to carry out the basic functions of life.
- Cells are made up of organelles that perform specific functions.

**A. Use the words from the box to complete the diagram of a plant cell.**

| | | | |
|---|---|---|---|
| cell membrane | cell wall | cytoplasm | endoplasmic reticulum |
| lysosome | nucleus | Golgi apparatus | vacuole |



Name _____ Date _____



# What Are the Parts of a Cell?

**B. Complete the sentences comparing the similarities and differences between plant and animal cells.**

1. Plant cells make their own food, but animals take in their food by ___eating other living things___.
2. While the cells of both plants and animals are surrounded by a thin, flexible ___cell membrane___, only plant cells have a ___cell wall___, a rigid outer layer for protection and support.
3. Both plant cells and animal cells store water, food, and waste in ___vacuoles___; animal cells may have ___several___ vacuoles, while plant cells often have ___one large, central___ vacuole.
4. ___Lysosomes___ help cells break down nutrients and old cell parts and are common in ___animal___ cells but rare in ___plant___ cells.
5. ___Chloroplasts___, containing pigments that absorb sunlight, are found in ___plant___ cells but not in ___animal___ cells.

**C. Add a word to each group. Then write a sentence that describes the group.**

lysosomes, vacuoles, ___ribosomes___

**Lysosomes, vacuoles, and ribosomes are all organelles.**

energy, support, ___reproduction___

**Energy, support, and reproduction are all basic needs of cells.**

bacteria, yeast, ___algae___

**Bacteria, yeast, and many kinds of algae are all single cell organisms.**

Name _____ Date _____



# What Are the Parts of a Cell?

| | |
|---|---|
| cell | cytoplasm |
| nucleus | organelle |

**Match the words from the box to each description. The words will be used more than once.**

| | |
|---|---|
| cell | the basic unit of a living organism |
| organelle | a small structure in cells that performs a specific function |
| cell | comes from another cell |
| nucleus | directs the activities of a cell |
| cytoplasm | thick fluid between the nucleus and the cell membrane |
| cell | carries out the functions of life |
| cytoplasm | surrounds lysosomes, vacuoles, and other cell parts |
| nucleus | stores DNA |
| cell | can make a copy of itself |
| organelle | a ribosome is one of these |

**Homework:** A mnemonic is a device such as a pattern of letters, words, or ideas that assists in remembering something. For example: Chloroplasts are filled with chlorophyll. Create a mnemonic to help you remember the name and function of a cell part or an organelle.

Name _____ Date _____



# What Are the Parts of a Cell?

## Glossary

| | |
|---|---|
| **conclusion** | decision or opinion reached by reasoning |
| **function** | proper work, normal action or use |
| **membrane** | a thin soft layer of tissue that lines or covers something |
| **organism** | a living thing formed of separate parts that work together to carry on the various processes of life |
| **pigment** | substance that occurs in and colors the tissues of a living thing |
| **proteins** | complex chemical compounds that make up the parts of cells and allow the cell to perform chemical reactions |

**Complete each sentence to tell about cells.**

1. Cells are the building blocks of every living **organism**.
2. Every organelle has a specific **function**.
3. The Golgi apparatus receives and processes **proteins**.
4. The **pigment** chlorophyll gives plants their green color.
5. Food, water, and gases enter cells through the cell **membrane**.
6. In the late 1800s, scientists made a **conclusion** that cells come from other cells.

**Vocabulary Skill: Word Parts**

In the word *multicellular*, the prefix *multi-* means "many," and the suffix *-ular* indicates the word is an adjective. Based on this information, write a definition for the word.

**Sample response: *Multicellular* means "having or consisting of many cells."**

Name _____ Date _____



# How Do Cells Make and Use Energy?

**Main Idea** To get energy, plant and animal cells break down sugar, releasing water and carbon dioxide.

- All living things require energy to survive.
- Cells break down glucose and capture its energy in a process called cellular respiration.
- Cells need energy to move, make proteins, divide, and transport materials.

**A. Complete the sentences to tell how cells use energy.**

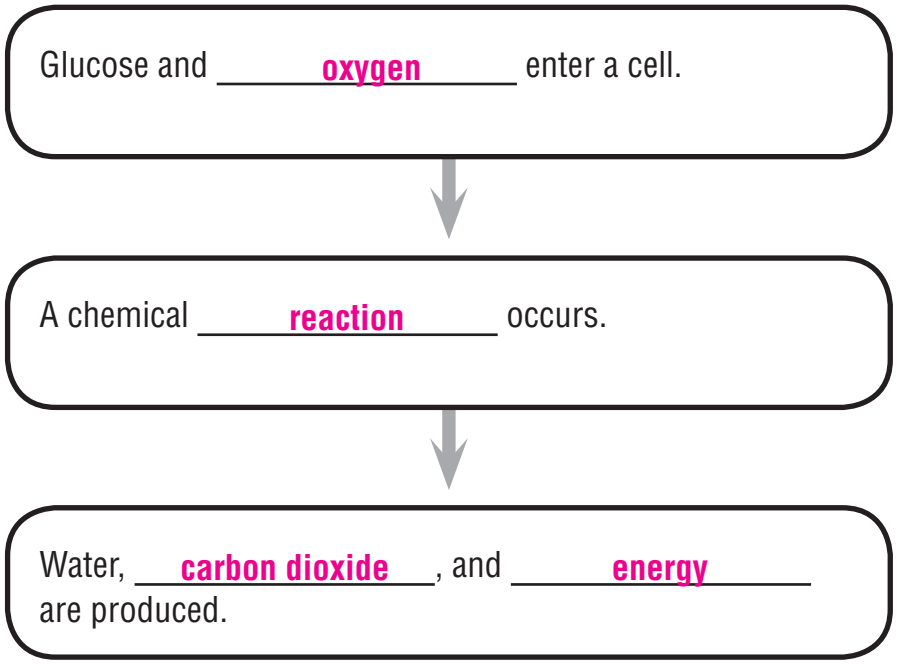
1. Plants get energy from food they make for themselves. Animals get energy from **food they take in from the outside**.
2. In order to acquire glucose, some animals eat plants. Other animals eat **plant-eaters**.
3. Energy for a flashlight is stored in a battery. Energy for a cell is stored in **ATP molecules**.
4. Animals are able to store glucose. However, animals cannot store **oxygen and carbon dioxide**.
5. When animals breathe in, they inhale oxygen, which is required for cellular respiration. When animals breathe out, they exhale **carbon dioxide**, which is **a waste product of cellular respiration**.
6. Some proteins allow cells to control the chemical reactions inside. Other proteins provide **structure and support for organisms**.
7. In passive transport, materials move from areas of high concentration to areas of low concentration. In active transport, **materials move from areas of low concentration to areas of high concentration**.

Name _____ Date _____



# How Do Cells Make and Use Energy?

**B. Complete the diagram to describe cellular respiration.**




**C. Rewrite each sentence about energy to make it true.**

**1.** Two factors that determine how much energy an animal needs are whether it has fur and how much it sleeps each day.

**Two factors that determine how much energy an animal needs are how big it is and how fast it moves.**

**2.** Plants require less energy than animals because they are much smaller than most animals.

**Plants require less energy than animals because they don't need energy to move from place to place.**

**3.** Plants use energy to carry out cellular respiration.

**Plants use energy for growth and transporting materials.**

# How Do Cells Make and Use Energy?

| cellular respiration | diffusion | osmosis |
|---|---|---|

**Match the words from the box to each description. The words may be used more than once.**

| | |
|---|---|
| **cellular respiration** | cells break down glucose in this process |
| **osmosis** | works to keep water inside cells |
| **diffusion** | the process that spreads substances through a gas or liquid |
| **cellular respiration** | serves to change glucose and oxygen into carbon dioxide gas and water |
| **diffusion** | spreads materials into and out of cells |
| **osmosis** | takes place across a membrane that lets water pass, but keeps out many things that are dissolved in the water |

**Homework:** Draw a cartoon illustrating the concepts of active transport and passive transport. For example, the cartoon could be of people crowding onto a subway car (active transport) and people exiting a subway car (passive transport). Be sure to label your drawing.

# How Do Cells Make and Use Energy?

## Glossary

| | |
|---|---|
| **division** | condition of being separated into equal parts |
| **propeller** | a wheel with curved blades |
| **reactions** | processes in which substances act on each other |
| **structure** | the arrangement of parts and elements |
| **transport** | process of carrying from one place to another |

**Use the words from the box to complete the paragraph about why cells need energy.**

Cells need energy to perform important life functions. First, all cells make and use proteins. Some proteins allow cells to control chemical **reactions**. Other proteins provide **structure** and support for organisms. Cells also need energy to create movement. For example, some single-celled organisms use a structure that acts as a **propeller**. Cell **division**, which allows an organism to grow, also requires energy. Finally, the **transport** of materials across a cell membrane requires energy.

**Vocabulary Skill: Word Parts**

The word *transport* consists of the prefix *trans-*, which means "across," and the root *port*, which means "to carry." Write your own definition of *transport* based on this information.

**Sample response: *Transport* means "to carry across."**

Name _____ Date _____

A.1.3
Main Idea

# How Are Cells Organized?

**Main Idea** Cells join together to perform basic life functions in multicellular organisms.

- Tissues are made up of specialized cells of the same type.
- Organs are made up of tissues that perform specific functions.
- Organisms are made up of organ systems that perform specific functions.

**A. Complete the chart to tell about the specialization of cells.**

| Type of Cell | Characteristics | Functions |
|---|---|---|
| skin | flat, arranged close together | form a protective layer around the body |
| nerve | long with many branches | deliver electrical impulses over long distances |
| muscle | larger than other cells, can contract and relax | cause movement |

**B. Complete each sentence to tell about organ systems.**

1. The digestive system breaks down food into nutrients that cells can absorb.

2. The respiratory system brings oxygen to the body and removes carbon dioxide.

3. The circulatory system brings oxygen and nutrients to body cells and removes wastes.

# How Are Cells Organized?

**C. Add the descriptions to the chart to tell how cells are organized.**

the basic building blocks of living things
a living thing made up of a combination of organ systems
a group of related organs that work together
a group of related tissues that perform a specialized function
a large group of similar specialized cells

Cells: the basic building blocks of living things

Tissues: a large group of similar specialized cells

Organs: a group of related tissues that perform a specialized function

Organ Systems: a group of related organs that work together

Organism: a living thing made up of a combination of organ systems

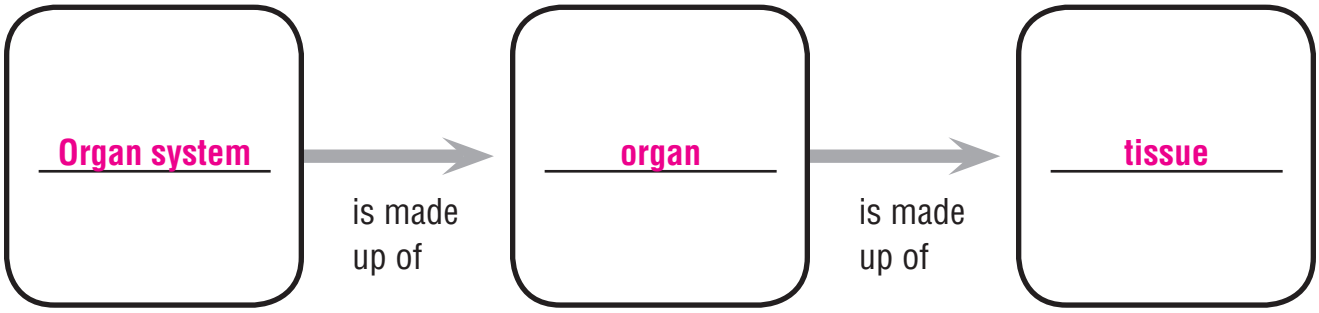
Name _____ Date _____



# How Are Cells Organized?

organ  organ system  tissue

**A. Use the words from the box to complete the diagram about cellular organization.**




**B. List four examples of cell organization in each of the following categories.**

| Tissues | Organs | Organ Systems |
|---|---|---|
| muscle | heart | digestive |
| nerve | brain | respiratory |
| bone | stomach | circulatory |
| skin | liver | muscular |

**Homework:** Choose an organ system that you would like to learn more about. Use the library or the Internet to research your choice, and then write a summary of what you learned.

Name _____ Date _____



# How Are Cells Organized?

## Glossary

| | |
|---|---|
| **absorb** | to take in and make part of itself |
| **complex** | made up of a number of parts |
| **contract** | to draw together, make shorter |
| **expel** | to force or drive out |
| **relax** | to loosen up, become less stiff |
| **simple** | made up of one part |
| **specialize** | to perform a specific function |

**Use the words from the box to complete the sentences to tell about cellular organization.**

1. Single-cell organisms have a ___simple___ structure compared to the ___complex___ structure of a multicellular organism.
2. Cells ___specialize___ in their functions.
3. Arm muscles ___contract___ to pick up an object and ___relax___ to put it down.
4. Cells ___absorb___ nutrients and ___expel___ wastes.

**Vocabulary Skill: Antonyms**

Antonyms are words that have opposite meanings. Identify the pair of antonyms in the box.

contract /relax

Name _____ Date _____



# How Do Plants Produce Food?

**Main Idea** Plants use energy from the Sun to make food. They combine carbon dioxide and water to make sugar, and release oxygen in the process.

- During photosynthesis, plants make their own food using energy from the Sun.
- Photosynthesis occurs in the chloroplasts of the leaves of plants. Chlorophyll is the pigment in chloroplasts that absorbs light.
- Plants remove carbon dioxide from the air and add oxygen and water vapor.

**A. Complete the diagram to tell about the process of photosynthesis.**

_Photosynthesis_ takes place in organelles called chloroplasts located in a plant's leaves.

↓

Inside the chloroplasts, a pigment called _chlorophyll_ absorbs light.

↓

During photosynthesis, the Sun's energy is used to split _water_ molecules into hydrogen and oxygen.

↓

The hydrogen then joins with carbon from carbon dioxide to form _glucose_.

↓

The plant releases _oxygen_ gas and water vapor into the atmosphere.

Name _____ Date _____



# How Do Plants Produce Food?

**B. Rewrite each statement about photosynthesis to make it true.**

1. Photosynthesis occurs in the roots of plants.

   **Photosynthesis occurs in the leaves of plants.**

2. Carbon dioxide enters a leaf through its veins.

   **Carbon dioxide enters a leaf through its stomata.**

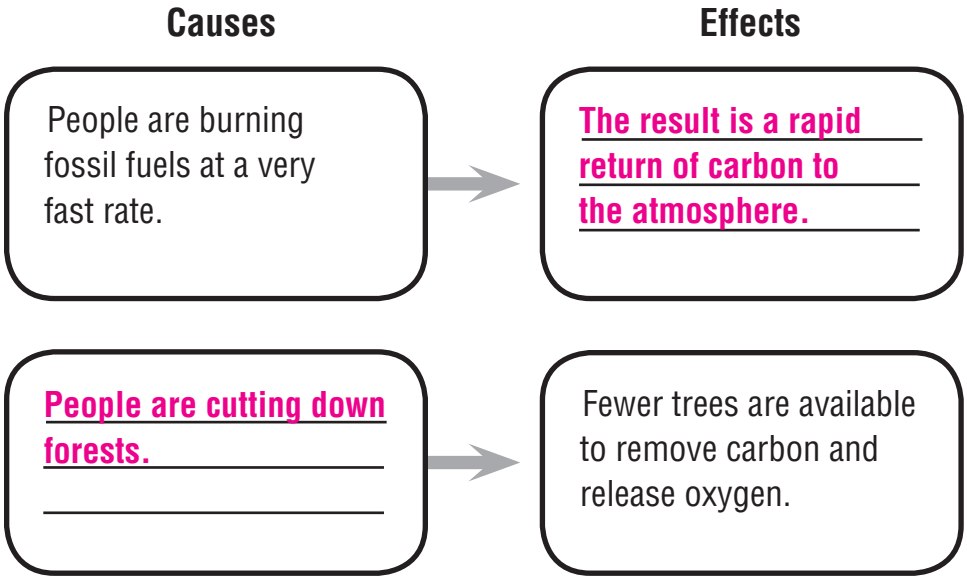
3. Chloroplasts use the energy of sunlight and oxygen to make glucose.

   **Chloroplasts use the energy of sunlight, carbon dioxide, and water to make glucose.**

4. Photosynthesis produces carbon dioxide and glucose.

   **Photosynthesis produces oxygen and glucose.**

**C. Complete the diagram to tell about the effects of human activities on the cycles of carbon and oxygen.**



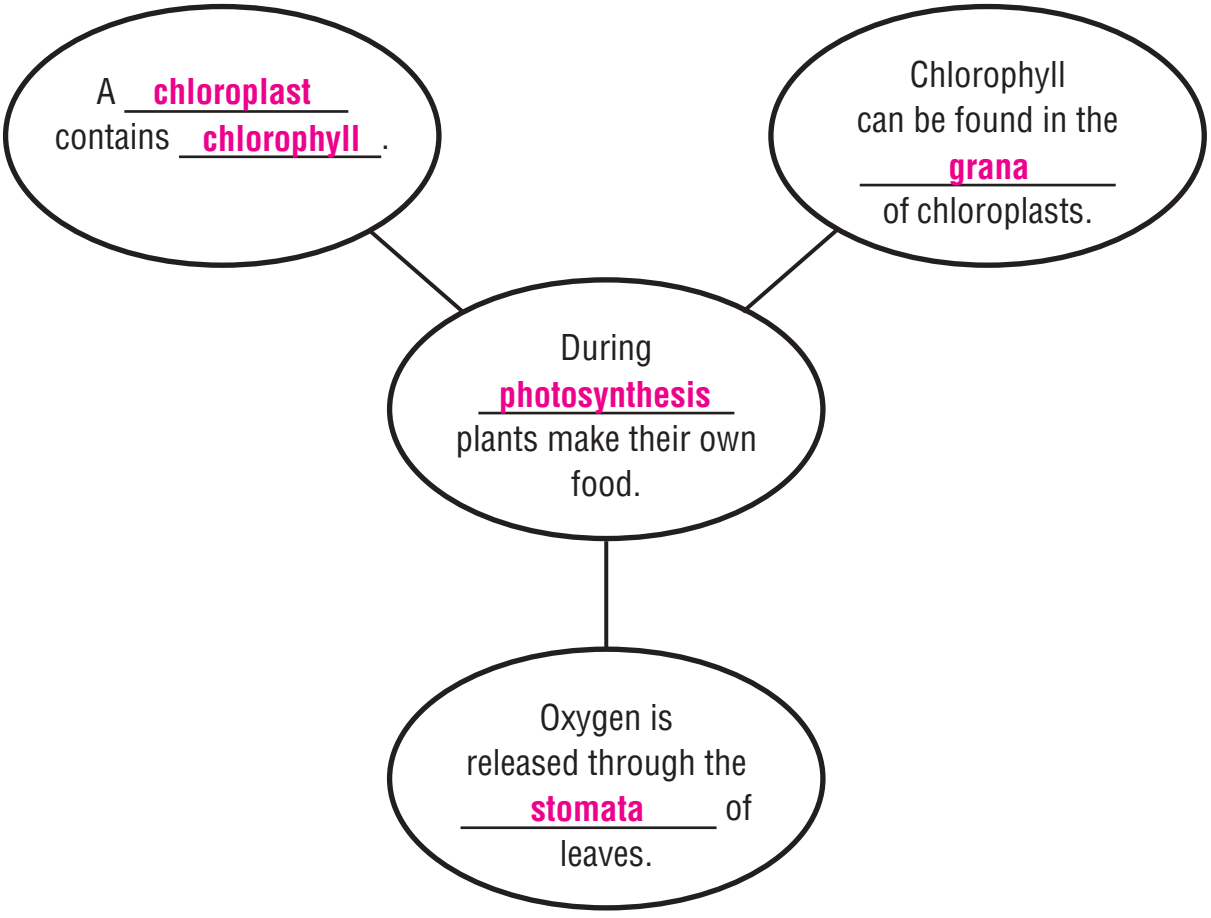
Name _____ Date _____



# How Do Plants Produce Food?

| | | |
|---|---|---|
| chlorophyll | grana | stomata |
| chloroplast | photosynthesis | |

**Complete the diagram with words from the box to tell about the process of photosynthesis.**




**Vocabulary Skill: Prefixes**

The prefix *chloro-* indicates the color green. What part of a tree is responsible for making its leaves green?

Chlorophyll is responsible for making its leaves green.

Name _____ Date _____

# How Do Plants Produce Food?

## Glossary

| | |
|---|---|
| **blade** | the flat, wide part of a leaf |
| **compound** | having more than one part |
| **epidermis** | a skinlike layer of cells in plants |
| **simple** | not divided into parts, single |
| **veins** | vessels forming the framework of a leaf |

**Use the words from the box to complete the sentences about the structure of leaves.**

1. The broad, flat portion of the leaf is called the _____blade_____.
2. A _____simple_____ leaf has a blade that is one piece.
3. A _____compound_____ leaf has a blade that is divided into parts.
4. The outer layer of a leaf is called the _____epidermis_____.
5. _____Veins_____ carry materials in and out of the leaf, connecting the leaf's cells to the rest of the plant.

**Homework:** Draw a diagram of the process of photosynthesis. Be sure to show what is needed for the process to occur and what results. Then write a paragraph that explains the process shown in your diagram.

Name _____ Date _____

A.2.2
Main Idea

# How Do Plants Move Materials?

**Main Idea** Plants have specialized tissues and use natural forces to transport water, minerals, and nutrients.

- In nonvascular plants, materials move from cell to cell through diffusion.
- In vascular plants, specialized tissues transport materials.
- Water moves up in vascular plants through the xylem because of cohesion, root pressure, and transpiration. Gravity moves sugar down through the phloem.

**A. Write *vascular* by each example or characteristic of a vascular plant. Write *nonvascular* by each example or characteristic of a nonvascular plant.**

vascular — sunflower

nonvascular — mosses

vascular — absorb water and minerals through roots

nonvascular — grow well with little light

vascular — redwood

vascular — roots, stems, and leaves

nonvascular — liverworts

vascular — veins

nonvascular — no leaves, stems, or roots

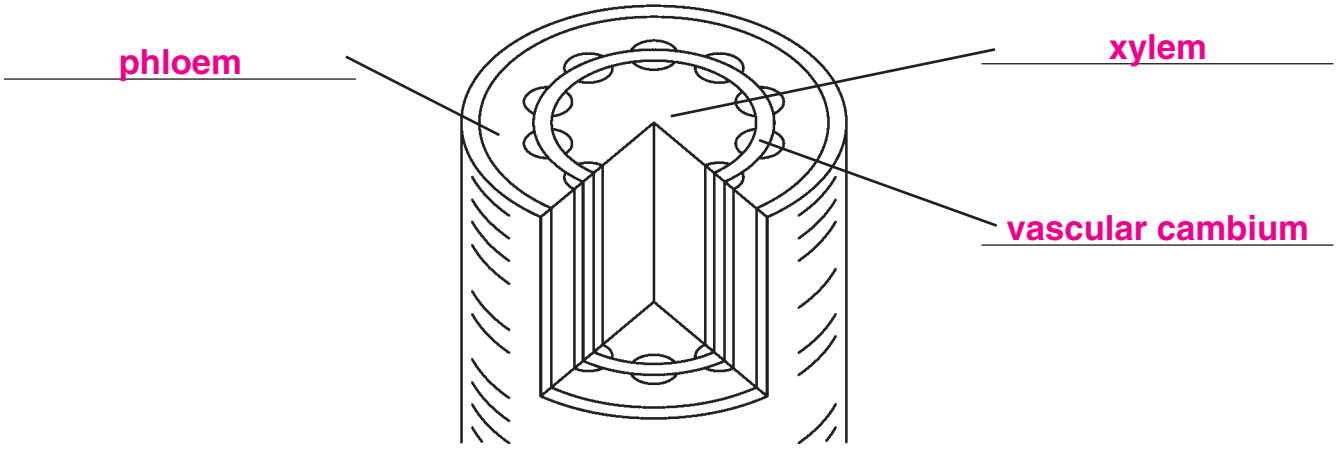
nonvascular — materials move from cell to cell

Name _____ Date _____

A.2.2
Main Idea

# How Do Plants Move Materials?

**B. Use these terms to label the diagram of a vascular plant: *phloem, xylem,* and *vascular cambium*.**




**C. Put a check by each statement that is true about the movement of water and nutrients through a vascular plant.**

✔ Water moves up in plants because of three factors: root pressure, cohesion, and transpiration.

_____ Root pressure is strong enough to push water through a plant on its own.

✔ Water molecules cling to each other as a result of a force called cohesion.

_____ Adhesion forces water to go down.

✔ Water is pulled upward by transpiration.

✔ Gravity pulls sugar from the leaves down to nourish the plant.

✔ About 99% of the water that enters the roots is transpired by the leaves.

Name _____ Date _____



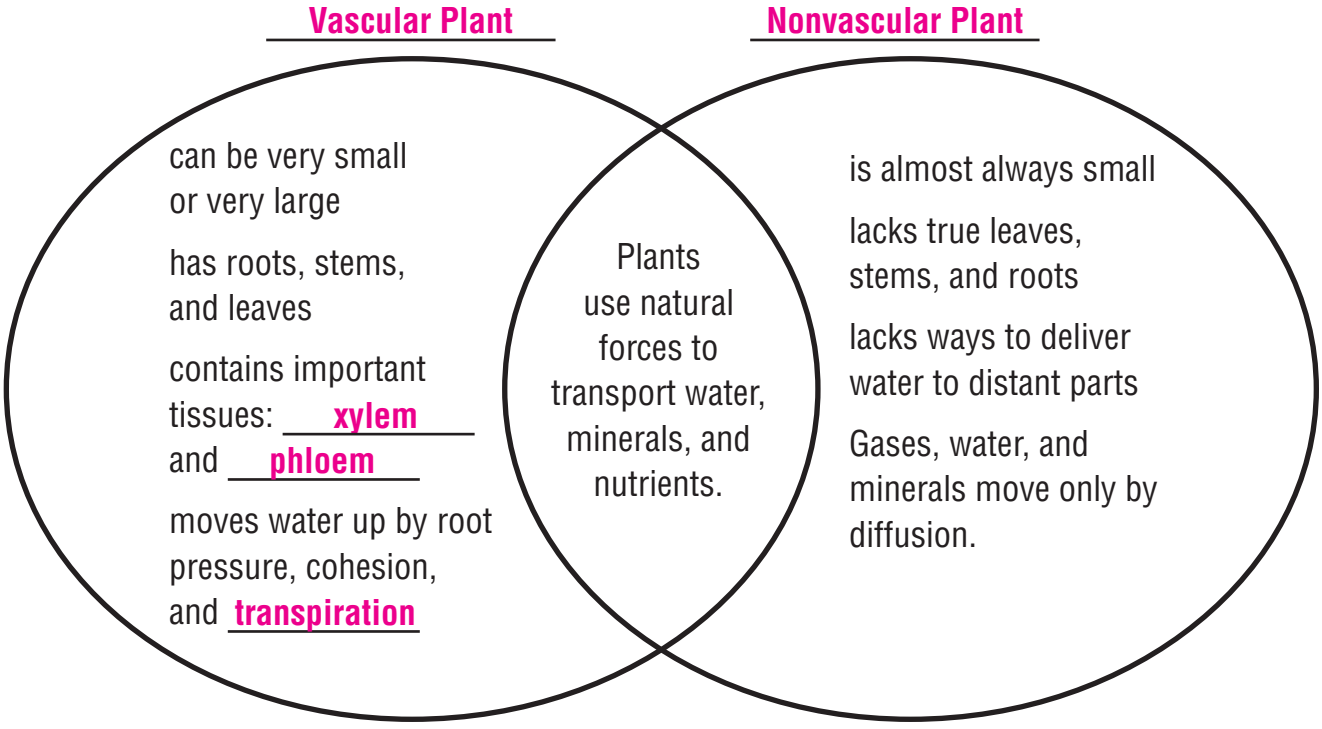
# How Do Plants Move Materials?

| | | |
|---|---|---|
| nonvascular plant | transpiration | xylem |
| phloem | vascular plant | |

**A. Match each word from the box with its description.**

| | |
|---|---|
| xylem | conducts water and minerals from roots to stems and leaves |
| phloem | conducts sugar from leaves to the rest of the plant |
| transpiration | evaporation of water through the surface of leaves |
| vascular plant | has specialized tissues that transport materials throughout it |
| nonvascular plant | lacks structures that transport sugar, water, and other materials between plant parts |

**B. Complete the diagram to compare and contrast vascular plants and nonvascular plants.**



# How Do Plants Move Materials?

## Glossary

| | |
|---|---|
| **adhesion** | condition of holding to, sticking to |
| **cohesion** | attraction between molecules of the same kind |
| **gravity** | the natural force that causes objects to tend to move to the center of the Earth |
| **nutrient** | any substance that a living thing needs for energy, growth, and repair of tissues |
| **tissues** | a group of cells that are similar in form and function |

**Use the words from the box to complete the sentences about the flow of materials through a vascular plant.**

1. Sugar produced in the leaves of a plant being pulled down through the plant is an example of _____**gravity**_____ at work.

2. Water molecules being attracted to other water molecules is an example of _____**cohesion**_____.

3. Glucose is an example of a _____**nutrient**_____.

4. Water molecules clinging to molecules of other substances is an example of _____**adhesion**_____.

5. Vascular _____**tissues**_____ conduct water, minerals, and sugar between different parts of the plant.

**Homework:** Write a brief explanation of the process of transpiration. Use sequence words to help clarify the steps in the process.

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

**Main Idea** The respiratory system brings oxygen into the body and removes wastes. The circulatory system carries oxygen to the cells and carries away wastes.

- The respiratory system brings oxygen to the blood and removes carbon dioxide from the blood.
- The circulatory system brings oxygen and nutrients to cells and takes away carbon dioxide and other wastes.
- The heart is the central organ of the circulatory system.

**A. Complete the diagram to tell how the respiratory system delivers oxygen to the blood.**

When you inhale, you take oxygen-filled air into your ___nose___ or ___mouth___.

↓

The air moves into a sturdy tube called the ___trachea___, which leads down your chest toward the ___lungs___.

↓

The trachea divides into two main tubes called ___bronchi___.

↓

Inside the lungs each bronchus divides into smaller and smaller tubes, leading to grapelike sacs called ___alveoli___.

↓

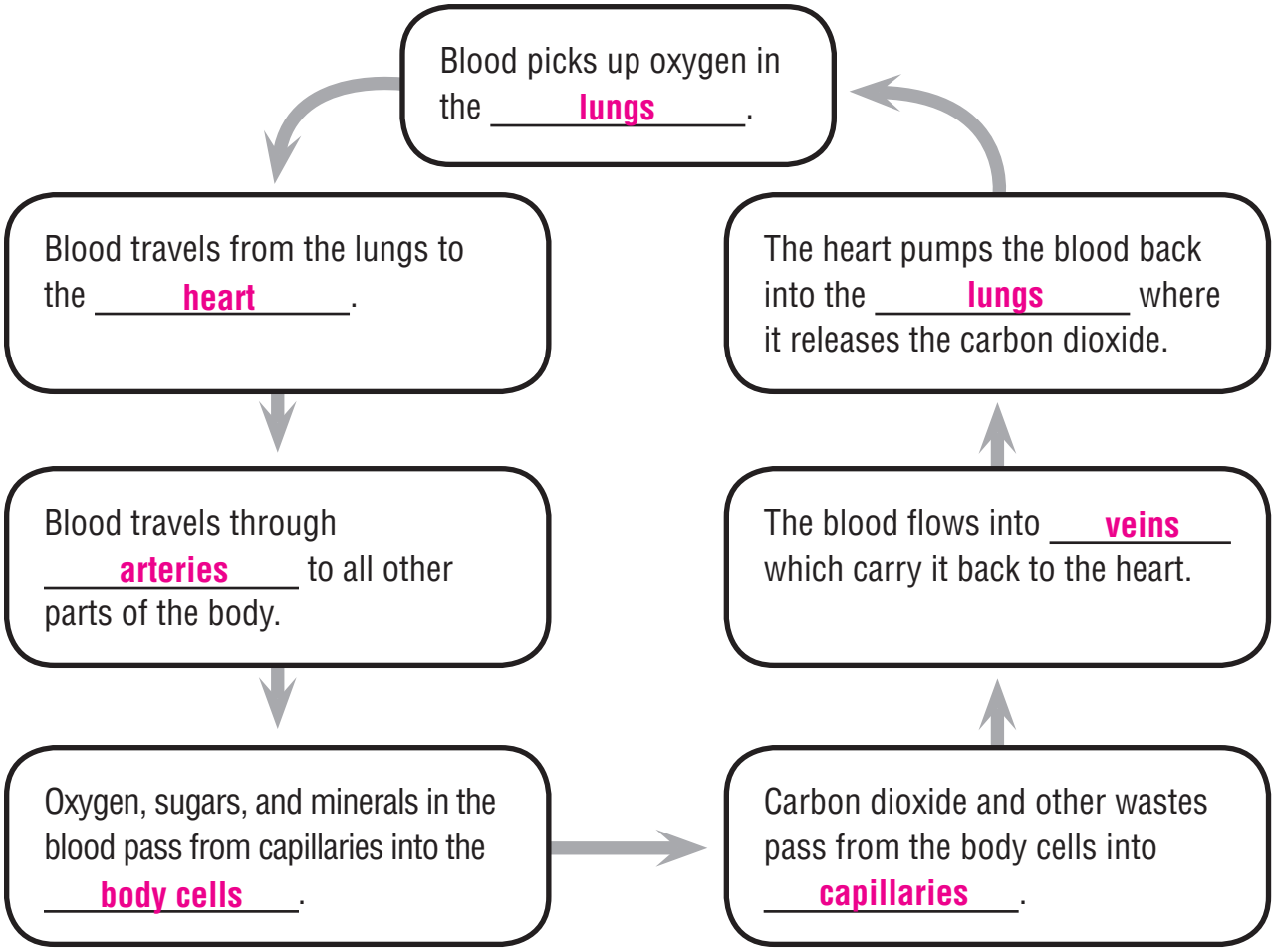
Each of these tiny structures borders a ___capillary___.

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

**B. Complete the diagram to show how blood circulates through the body.**




**C. Complete the sentences to tell about the human heart and its functions.**

1. The heart is at the center of the circulatory system.
2. The four chambers of the heart are the right atrium, the left atrium, the right ventricle, and the left ventricle.
3. The atria receive blood from the veins.
4. The ventricles pump blood to the body.

Name _____ Date _____



# What Are the Respiratory and Circulatory Systems?

| | | |
|---|---|---|
| artery | circulatory system | heart |
| capillary | respiratory system | vein |

**Use the words from the box to complete the sentences about the circulatory and respiratory systems. Some words may be used more than once.**

1. Nutrients pass through the wall of a ___capillary___ into the body cells.
2. A(n) ___artery___ is a blood vessel that carries blood away from the heart.
3. The ___circulatory system___ brings oxygen and nutrients to the body's cells and removes carbon dioxide and other wastes from the cells.
4. The ___heart___ is the organ that pumps blood through the circulatory system.
5. The lungs are the central organ of the ___respiratory system___.
6. Blood picks up oxygen in the ___lungs___.
7. A(n) ___vein___ is a blood vessel that carries blood to the heart.

**Vocabulary Skill: Word Origins**

The word *circulatory* comes from the Latin word *circulus,* which means "circle or ring." Explain how the meaning of *circulus* relates to the circulatory system.

**Sample response: The circulatory system is a system in which blood moves in a "circle" throughout the body.**

# What Are the Respiratory and Circulatory Systems?

## Glossary

| | |
|---|---|
| **alveoli** | tiny air sacs in the lungs |
| **bronchi** | two tubes leading from the trachea into the lungs |
| **hemoglobin** | a substance in red blood cells used to carry oxygen and carbon dioxide |
| **plasma** | the liquid part of the blood |
| **platelets** | small pieces of cells that help the blood clot |
| **trachea** | a sturdy tube that leads down the chest to the bronchi |

**Write the word from the box that matches each clue.**

hemoglobin — found in red blood cells

trachea — leads to the bronchi

bronchi — carries air into the lungs

platelets — help the body heal wounds

plasma — carries blood cells

alveoli — bordered by a capillary

**Homework:** Draw a diagram that shows how blood is carried into the heart and out of the heart. Label the diagram.

Name _____ Date _____

A.3.2
Main Idea

# What Is the Digestive System?

**Main Idea** To function properly, living things need nutrients found in foods. The digestive system breaks down food to release these nutrients.

- The digestive system breaks down food into nutrients the body can use. Starches break down into sugars in the mouth.
- The stomach mixes and stores food. It further breaks down food into a soupy mix.
- Digestion finishes in the small intestine and nutrients are absorbed into the blood. Water and minerals are absorbed from the large intestine.

**A. Complete the outline about the digestive system.**

**I.** You must take in food.

**A.** Food provides the body with ___nutrients___.

**B.** The body uses ___different kinds___ of nutrients for ___different purposes___.

**II.** Your body releases nutrients from food in a process called ___digestion___.

**A.** The ___digestive system___ is a group of organs that breaks food down into ___small particles___ that the body can use.

**B.** These small particles enter the ___blood___.

**III.** You should eat a ___balanced___ diet.

**A.** A balanced diet is made from a variety of ___different foods___.

**B.** ___Drinking lots of water___ helps your digestive system work properly.

**C.** You should avoid eating too many ___fats and sweets___.

**IV.** You should eat ___right___ every day.

**A.** Your body can store certain ___nutrients___.

**B.** Many ___vitamins and minerals___, however, cannot be stored.

Name _____ Date _____



# What Is the Digestive System?

**B. Complete the chart to tell about nutrients.**

| Nutrient | Uses | Examples |
|---|---|---|
| Carbohydrates | main source of energy for the body | pasta, potatoes, rice and other grains |
| Proteins | used to replace, repair, and grow new cells and tissues | fish, beef, chicken, beans |
| Vitamins and minerals | help in various ways, including helping nerves work | fruits, vegetables, fortified milk |
| Fats | provide energy and keep skin healthy | butter, oil, ice cream |

**C. Use the numbers 1 through 9 to put the stages of digestion in order.**

3 Chewed food moves into the esophagus.

7 Undigested food and other substances pass to the large intestine.

5 Food enters the small intestine where most digestion takes place.

1 Digestion begins in the mouth.

6 Nutrients from the digested food pass from villi into the blood.

8 Water and minerals from food are absorbed into the blood.

2 Chewing grinds food into smaller pieces, and saliva moistens the food and begins to break it down.

4 The stomach squeezes the food and mixes it with digestive fluids.

9 Remaining undigested food passes as solid waste.

Name _____ Date _____



# What Is the Digestive System?

| | | |
|---|---|---|
| digestive system | large intestine | stomach |
| esophagus | small intestine | |

**Use the words in the box to complete the paragraph about digestion. Some words may be used more than once.**

The **digestive system** is a group of organs that breaks down food into small pieces the body can use. Food moves from the mouth to the stomach through the **esophagus**. The **stomach** is a muscular organ that stores and helps digest food. When food leaves the stomach, it enters the **small intestine** where more digestion takes place. Nutrients from the digested food pass through villi in the **small intestine** into the blood and to every cell in the body. Undigested food and other substances pass to the **large intestine**.

**Vocabulary Skill: Word Origins**

The word *digestive* comes from the Latin word *digestus,* meaning "to divide or distribute." Write an explanation of the term *digestive system* using this information.

**Sample response: The digestive system divides food into small particles that are distributed to the body cells.**

# What Is the Digestive System?

## Glossary

| | |
|---|---|
| **acid** | a corrosive chemical substance |
| **carbohydrates** | organic compounds that release energy when broken down by an organism |
| **enzymes** | substances produced by an organism that bring about specific biochemical reactions |
| **glands** | organs that secrete particular chemical substances |
| **nutrients** | substances that provide nourishment essential for growth and the maintenance of life |

**Use the words from the box to complete each sentence about the digestive system.**

1. Digestion helps to release ___nutrients___ from food that the body can use.
2. People get most of the energy their bodies need from eating ___carbohydrates___.
3. Saliva is produced by ___glands___ that are located at the back and bottom of the mouth.
4. The ___enzymes___ in saliva break down the starch in foods like bread and potatoes.
5. Digestive fluids in the stomach contain a(n) ___acid___ that breaks down food.

**Homework:** Create a timeline to show how long it takes food to move through the digestive system. Begin your timeline with food entering the mouth.

Name _____ Date _____

A.3.3
Main Idea

# What Is the Excretory System?

**Main Idea** All living things produce wastes. In humans, the excretory system removes wastes and helps maintain water levels.

- Kidneys filter wastes from blood and produce urine.
- People with kidney problems can often be helped with dialysis or a kidney transplant.
- Plants and animals use different methods of removing wastes.

**A. Complete the diagram to tell about the excretory system.**

| Causes | Effects |
|---|---|
| The body produces a lot of **waste**. | The **excretory system** removes it. |
| The body produces carbon dioxide. | The **lungs** remove it. |
| Blood carries wastes that contain **nitrogen**. | The **liver** converts nitrogen waste into **urea**. |
| Blood then contains **urea**. | The **kidneys** filter out the urea from blood. |
| When urea and water are filtered by the kidneys, **urine** results. | The **ureters** carry urine to the **bladder**. |
| The **urine** in the bladder causes it to increase in size. | Sensors detect its size and **signal the brain** that it needs to be emptied. |

Name _____ Date _____



# What Is the Excretory System?

**B. Rewrite each statement about excretory system problems to make it true.**

1. If the excretory system works poorly or stops working, vitamins and minerals will gradually build up in the body.

   **If the excretory system works poorly or stops working, wastes and poisons will gradually build up in the body.**

2. Kidney disease can only occur in adults.

   **Kidney disease can occur in children and adults.**

3. Drinking lots of water and eating a healthy diet are two important steps to keeping your ureters healthy.

   **Drinking lots of water and eating a healthy diet are two important steps to keeping your kidneys healthy.**

**C. Put the steps in order to describe dialysis.**

**3** Waste and extra fluid are removed from the blood.

**2** Blood is filtered in a machine.

**4** Filtered blood is returned to the body.

**1** Blood containing wastes is removed from the body.

**D. Match each term with its waste removal system. Use each term only once.**

| | | |
|---|---|---|
| camels | mammals | plants |
| earthworms | plant cells | snakes |

**earthworms** diffuse wastes directly to the outside

**snakes** change nitrogen wastes into uric acid

**mammals** make urea which they flush out with water

**camels** make urine saltier than sea water

**plant cells** often store wastes in a central vacuole

**plants** may also keep wastes in unwanted parts

Name _____ Date _____



# What Is the Excretory System?

bladder excretory system kidney

**A. Use the words from the box to complete each sentence.**

1. The job of the **excretory system** is to remove wastes and to maintain water balance.
2. The **kidney** is a bean-shaped organ located near the middle of the back.
3. The **bladder** is a muscular bag that holds urine.

**B. Write a word from the box next to each phrase that describes it. Some words may be used more than once.**

**bladder** sensors detect its size and signal the brain when it needs to be emptied.

**kidney** filters urea from the blood

**kidney** helps the body maintain the right water balance

**excretory system** involves different processes and organs spread throughout the body

**kidney** surrounded by a layer of fat for protection

**bladder** connected to kidneys by ureters

**Homework:** Write two or three sentences that explain how the kidneys and bladder work together in the excretory system.

# What Is the Excretory System?

## Glossary

| | |
|---|---|
| **dialysis** | process of cleansing the blood artificially |
| **filter** | straining out substances from a liquid or gas by slow passage through tissues, cloth, paper, sand, or charcoal |
| **urea** | substance present in the urine of mammals |
| **urine** | the liquid waste product that is produced by the kidneys |
| **wastes** | materials that the body cannot use |

**Use the words from the box to complete the paragraph about the excretory system. Some words may be used more than once.**

The excretory system removes **wastes** from the body. As key organs of the excretory system, the kidneys **filter** the blood and produce **urine**. The urine of all mammals contains **urea**. If a person's kidneys are not working, **wastes** can be removed from the blood by **dialysis**. In this process, a machine is used to **filter** out **wastes** and other fluids.

**Vocabulary Skills: Word Origins**

The word *dial* comes from a Latin word meaning "day." The face of a sundial was called "the wheel of day" and people started using the word for other marked circles. How does the origin of *dialysis* relate to its meaning?

**Sample response: The process is like a circle: Blood comes out of the body, through a machine, and back into the body.**

Name _____ Date _____



# Where Is Earth's Water?

**Main Idea** Most of Earth's water is salt water contained in the oceans.

- Oceans and seas make up 97 percent of Earth's water.
- Earth's fresh water is located in rivers, lakes, underground, and as ice in glaciers.
- Distillation and reverse osmosis are processes used to remove salt from salt water.

**A. Complete the diagram to tell about salt water oceans and seas.**

As water from runoff moves across the land, it dissolves **salts and other minerals** in **soil and rock**.

↓

The runoff carries salts and other minerals into **streams and rivers**.

↓

Eventually, the rivers empty into **oceans and seas**, bringing the salts and other minerals with them.

↓

Over time—millions of years—the deposits accumulate, making the water **salty**.

**B. Complete the diagram to tell why fresh water is a valuable resource.**

Fresh Water: A Valuable Resource

- Much of the fresh water supply is **not available for everyday use**.
- It is **not evenly distributed** over Earth's surface.
- **Pollution** can damage the water supply.

Name _____ Date _____

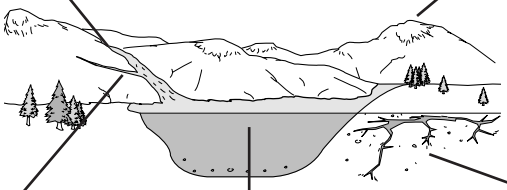


# Where Is Earth's Water?

**C. Complete each sentence in the diagram to identify sources of Earth's fresh water.**

A(n) **river** is a body of water that flows downhill in a channel.

About two-thirds of Earth's fresh water is "locked away" as ice in **glaciers and polar ice caps**.



A(n) **stream** is a small river.

**Lakes** are bodies of water surrounded by land.

**Groundwater** is water that collects in spaces and cracks in rocks and soil underground.

**D. Complete the chart to tell about the process of desalination.**

| Desalination |
|---|
| **Processes**<br>1. Distillation: **Ocean water is heated. Water vapor forms and leaves behind the solid salts. In a separate chamber, the water vapor is cooled and condenses into fresh water**.<br>2. Reverse osmosis: **Salt water is pumped at high pressure through a membrane. Holes in the membrane let water molecules pass through, but trap dissolved salts**. |
| **Drawbacks**<br>1. The desalination plants are **very expensive to run**.<br>2. The plants produce brine, which can **pollute groundwater and make water too salty for living things**. |

Name _____ Date _____



# Where Is Earth's Water?

groundwater runoff desalination

**Match each word from the box to the statement that describes it. Each word will be used more than once.**

groundwater — water that collects in spaces and cracks in rocks and soil underground

runoff — the main source of salt in oceans and seas

groundwater — one of the two main sources of fresh water

desalination — the removal of salt from salt water to make fresh water

runoff — rainwater that flows over land without sinking into the soil

desalination — provides less than one percent of the world's fresh water

runoff — carries salts and other minerals into streams and rivers

groundwater — makes up about 94 percent of Earth's usable fresh water supply

desalination — an expensive process that produces brine

**Homework:** Explain the difference between surface water and groundwater in a few sentences.

Name _____ Date _____



# Where Is Earth's Water?

## Glossary

| | |
|---|---|
| **condenses** | changes from a gas or vapor to a liquid |
| **distillation** | the process of boiling a liquid and condensing and collecting the vapor to purify the liquid |
| **evaporates** | changes from a liquid to a gas or vapor |
| **membrane** | a thin sheet or skin |
| **molecules** | groups of two or more atoms joined together in a chemical bond |
| **osmosis** | the movement of a solvent through a membrane separating two solutions of different concentrations |

### The Process of Distillation

Ocean water is collected and heated.

↓

The hot water **evaporates** and becomes water vapor, leaving the solid salts behind.

↓

In a separate chamber, the water vapor is cooled and **condenses** back into liquid fresh water.

### The Process of Reverse Osmosis

Salt water is pumped at high pressure through a thin membrane.

↓

Holes in the membrane let water **molecules** pass through, but trap dissolved salts.

↓

Fresh water is produced.

**Vocabulary Skill: Multiple-Meaning Words**

**The word *condense* has more than one meaning. Write two meanings this word can have. Use a dictionary to help you.**

**Sample response: The word *condense* can mean "to change from a gas to a liquid form." The word can also mean "to make or become less in size or volume."**

Name _____ Date _____



# How Do Communities Get Water?

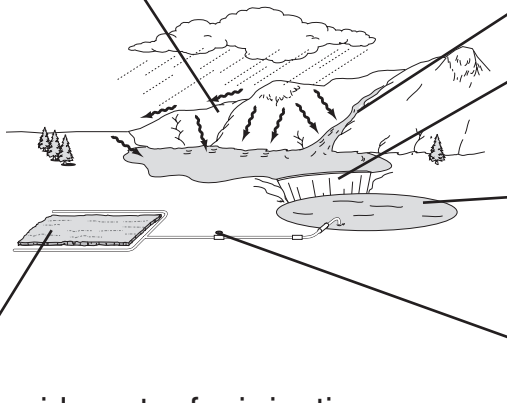
**Main Idea** Communities get fresh water from both underground sources and surface sources.

- Rivers provide drinking water.
- Dams create reservoirs that collect and store water for drinking and irrigation.
- Groundwater from wells and springs supply drinking water.
- Drinking water is processed in purification plants.

**A. Complete each sentence to identify the sources and systems that provide Californians with fresh water.**

Only about 35% of the **rain** and **snow** that falls in California becomes **runoff** that supplies rivers and lakes.

**Rivers** provide much of the drinking water for millions of Californians.



**Dams** create reservoirs.

A(n) **reservoir** is a place that collects and stores water.

Reservoirs also provide water for irrigation, the supplying of **fresh water** to farm fields.

A(n) **aqueduct** is a system of channels, pipes, and tunnels that carries water a long distance.

Name _____ Date _____



# How Do Communities Get Water?

**B. Complete the sentences to tell about groundwater.**

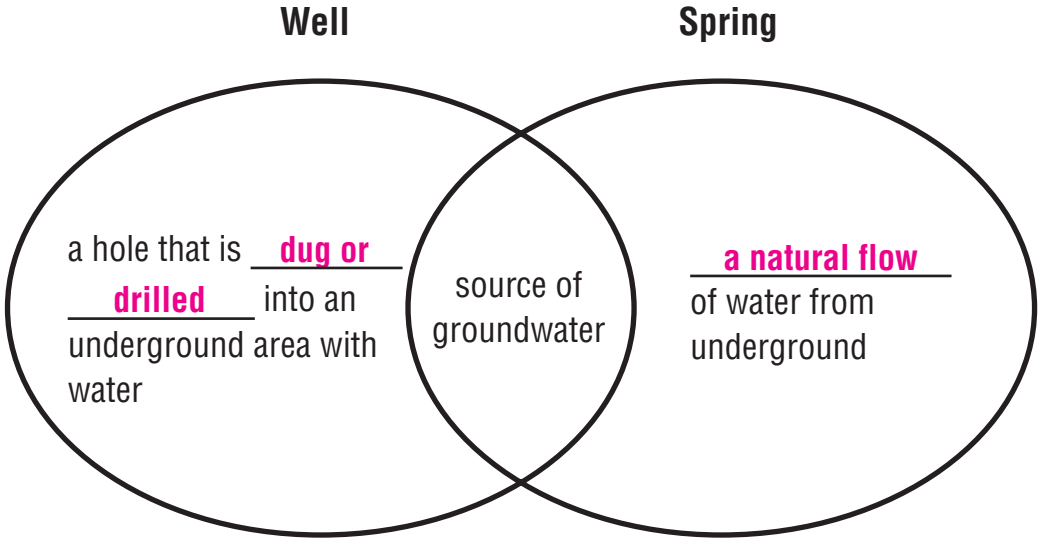
1. The source of most groundwater is **rain or melted snow** that sinks into the **soil**.

2. Water at the surface seeps downward until it reaches a layer of **solid rock** or **tightly packed clay**.

3. Water cannot **penetrate** this layer, so it fills in the spaces in soil and rock **above the layer**.

4. When all the **spaces** are filled with **water**, the ground is said to be **saturated**.

**C. Complete the diagram to compare and contrast wells and springs.**



Name _____ Date _____



# How Do Communities Get Water?

| | | | |
|---|---|---|---|
| aquifer | aqueduct | irrigation | reservoir |
| spring | water table | watershed | well |

**Use a word from the box to complete each sentence about the water supply.**

1. A(n) **watershed** is a region of land that drains into a river.

2. **Irrigation** is the supplying of fresh water to farm fields.

3. A(n) **spring** is a natural flow of water from underground.

4. A(n) **aqueduct** is a system of channels, pipes, and tunnels that carries water a long distance.

5. A(n) **reservoir** is a place that collects and stores water.

6. An underground layer of rock or soil through which water moves easily is a(n) **aquifer**.

7. The surface of a layer of saturated ground is the **water table**.

8. A(n) **well** is a hole dug or drilled into an underground area saturated with water.

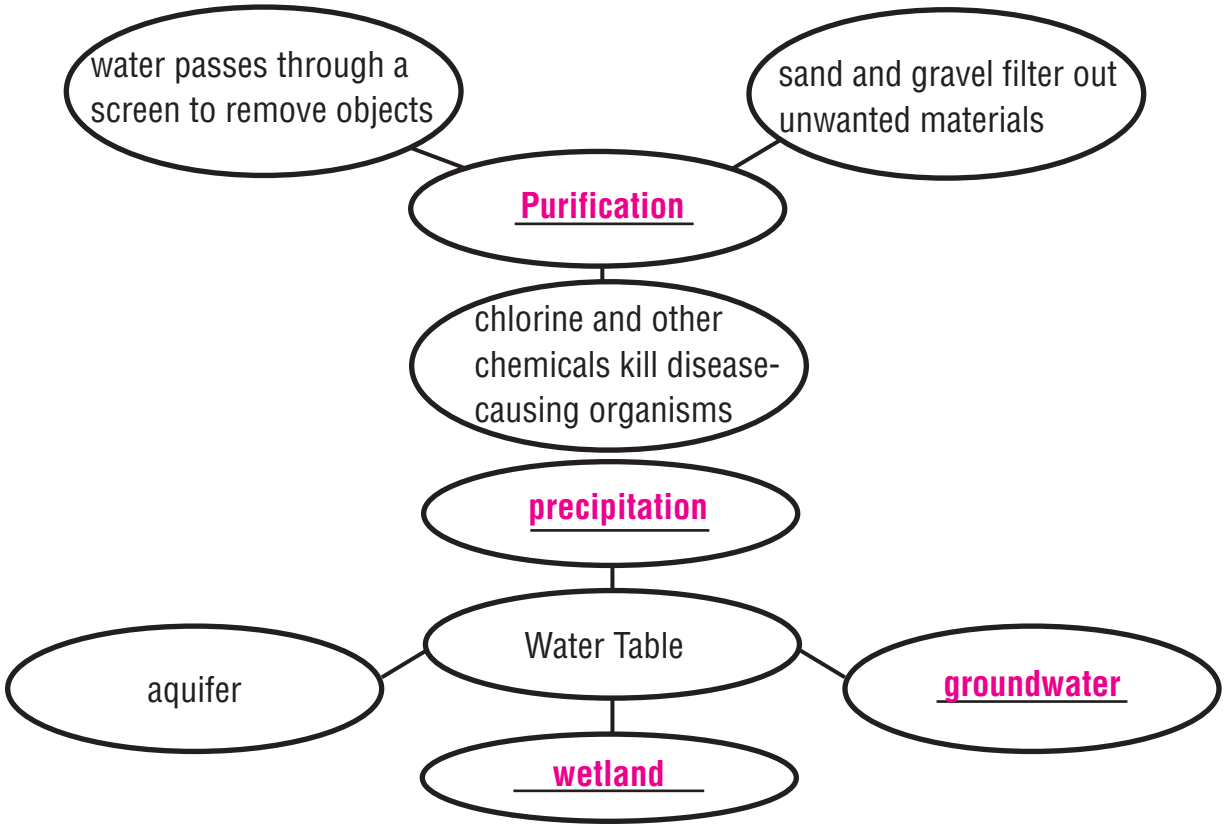
**Homework:** Write a short paragraph explaining why aqueducts are necessary in parts of California.

# How Do Communities Get Water?

## Glossary

| | |
|---|---|
| **groundwater** | water beneath the surface of the earth |
| **precipitation** | water, such as rain, snow, or sleet that falls to the surface of Earth |
| **purification** | the act of cleansing or purifying water |
| **wetland** | a lowland area that is saturated with water |

**Use words from the box to complete the diagrams.**




**Vocabulary Skill: Multiple-Meaning Words**

**The word *root* has more than one meaning. Write two meanings this word can have.**

**Sample response: The word *root* can refer to the part of a plant that absorbs water from the soil, and it can mean "to cheer for a person or a team."**

Name _____ Date _____



# How Can Fresh Water Be Used Wisely?

**Main Idea** Water should be conserved in order to make fresh water supplies last longer.

- California's growing population and crops need huge amounts of fresh water.
- About 1,300 dams and reservoirs, six major aqueduct systems, and other structures shift water from wetter areas to drier areas.
- Californians can conserve water by recycling and by decreasing their use of water.

**A. Complete the cause-and-effect diagram about California's water needs.**

| Causes | Effects |
|---|---|
| California has the **largest** population of any state. | The state faces big challenges in providing enough **water** to everyone. |
| The state's people and farm fields are not close to its major water **supplies**. | A large system of canals, pipes, aqueducts, dams, pumps, and reservoirs serve to **transfer** water. |
| Californians' water needs have begun to grow **greater** than their supply. | New steps are being taken so that **everyone** has the water they need. |

Name _____ Date _____



# How Can Fresh Water Be Used Wisely?

**B. Rewrite each statement about California's water supply to make it true.**

1. The 238-mile-long Los Angeles Aqueduct brings water from Los Angeles over the mountains to Owens Valley.

   **The 238-mile-long Los Angeles Aqueduct brings water to Los Angeles over the mountains from Owens Valley.**

2. The Sacramento-San Joaquin River system supplies water to northern California.

   **The Sacramento-San Joaquin River system supplies water to central and southern California.**

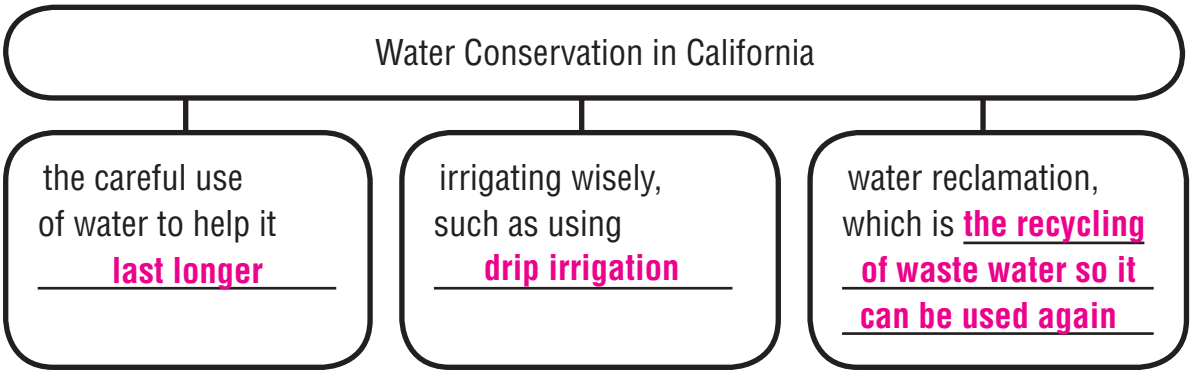
3. The Colorado River Aqueduct carries river water from the Colorado to the city of Los Angeles.

   **The Colorado River Aqueduct carries river water from the Colorado to the city of San Diego.**

4. "The 4.4 Plan" is an agreement between the states that share water from the Sacramento River and promotes laws and practices that increase water use.

   **"The 4.4 Plan" is an agreement between the states that share water from the Colorado River and promotes laws and practices that cut back water use.**

**C. Complete the diagram to tell about water conservation.**




**Homework:** Make a list of what you do to help conserve water.

Name _____ Date _____



# How Can Fresh Water Be Used Wisely?

conservation water reclamation

**Match the words from the box with the phrases below.**

conservation **1.** the careful use of a natural resource

conservation **2.** replacing old toilets with newer models that use less water

water reclamation **3.** recycling waste water

conservation **4.** taking shorter showers

water reclamation **5.** between 50 and 75 percent of waste water from homes and offices could be reused to wash cars or to water lawns

conservation **6.** turning off the water as we brush our teeth

**Vocabulary Skill: Suffixes**

**Some nouns can be formed by adding the suffix *-tion* to the verb form. Explain how to form a noun from the word *conserve*.**

**Sample response: For a word that ends in *e*, you first drop the *e* and add an *a* before adding the suffix *-tion*.**

# How Can Fresh Water Be Used Wisely?

## Glossary

| | |
|---|---|
| **encourage** | to stimulate; spur |
| **irrigate** | to supply with water by means of streams or pipes |
| **recycling** | extracting useful materials from waste |
| **resource** | an available supply that can be drawn upon as needed |
| **seeps** | passes slowly through small openings |

**Use the words from the box to complete the sentences about water conservation.**

1. Conserving a **resource** will help it last longer.
2. Most of California's water is used to **irrigate** farms and crops.
3. Much of the water used from irrigation canals evaporates, runs off the land, or **seeps** into soil.
4. The state of California has passed laws to **encourage** water conservation.
5. One law addresses water reclamation, the **recycling** of waste water.

**Vocabulary Skill: Prefixes**

The prefix *re-* means "once more" or "again" when added to a base word. How does knowing this prefix help you understand the meaning of *recycle*? Use an example to help you answer the question.

**Sample response: When you recycle, you change a waste product into something you can use again. So you are returning the material to a earlier stage in the cycle. For example, tin is used to make soda cans. People can recycle the soda cans so that the tin can be used again to make new soda cans or other products.**

Name _____ Date _____



# How Does Water Change State?

**Main Idea** On Earth, water exists in three states: liquid water, solid ice, and a gas called water vapor. Water changes from one state to another in processes that make up the water cycle.

- Earth's fresh water is cleaned and renewed in the processes that make up the water cycle.
- Liquid water evaporates and changes to water vapor in the air. When cooled, it changes back to a liquid or a solid and falls to Earth as rain, sleet, snow, or hail.
- Groundwater collects in underground spaces between soil and rock. Runoff is water that flows over the ground, eroding the soil.

**A. Put a check next to each statement that is true about water in the environment.**

✔ **1.** The water cycle is a natural process that restores and cleans Earth's water supply.

_____ **2.** Only 30 percent of the Earth's surface is covered with water.

✔ **3.** Unwanted materials can pollute water on Earth's surface.

✔ **4.** Most fresh water on Earth is found underground and in glaciers and ice caps.

_____ **5.** The water cycle adds pollution to Earth's fresh water supply.

_____ **6.** Water exists in only two states: liquid water and water vapor.

✔ **7.** People use fresh water for drinking, cooking, and growing food.

✔ **8.** About 97 percent of the Earth's water is salt water.

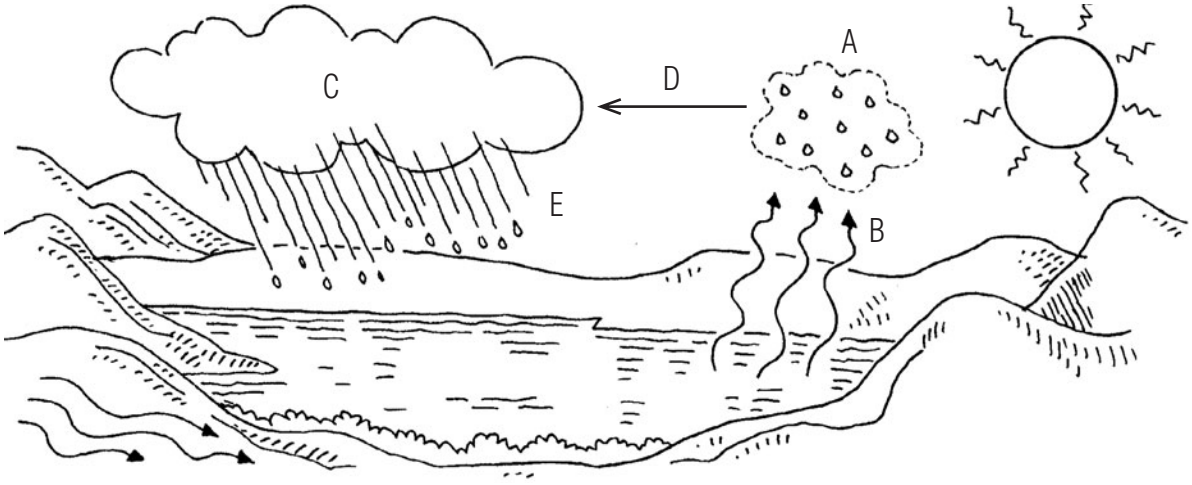
_____ **9.** In the water cycle, water moves from the Sun to Earth's surface.

Name _____ Date _____



# How Does Water Change State?

**B. Use the diagram below to answer the questions about the water cycle.**




1. What is shown as A?
   **water vapor**
2. What part of the water cycle is illustrated by B?
   **Water evaporates from Earth's surface.**
3. What is shown as C?
   **clouds**
4. What part of the water cycle is illustrated by D?
   **Water vapor condenses into water droplets and forms clouds.**
5. What part of the water cycle is illustrated by E?
   **Water in the atmosphere returns to the surface as precipitation.**
6. What are four types of precipitation?
   **rain, sleet, snow, hail**

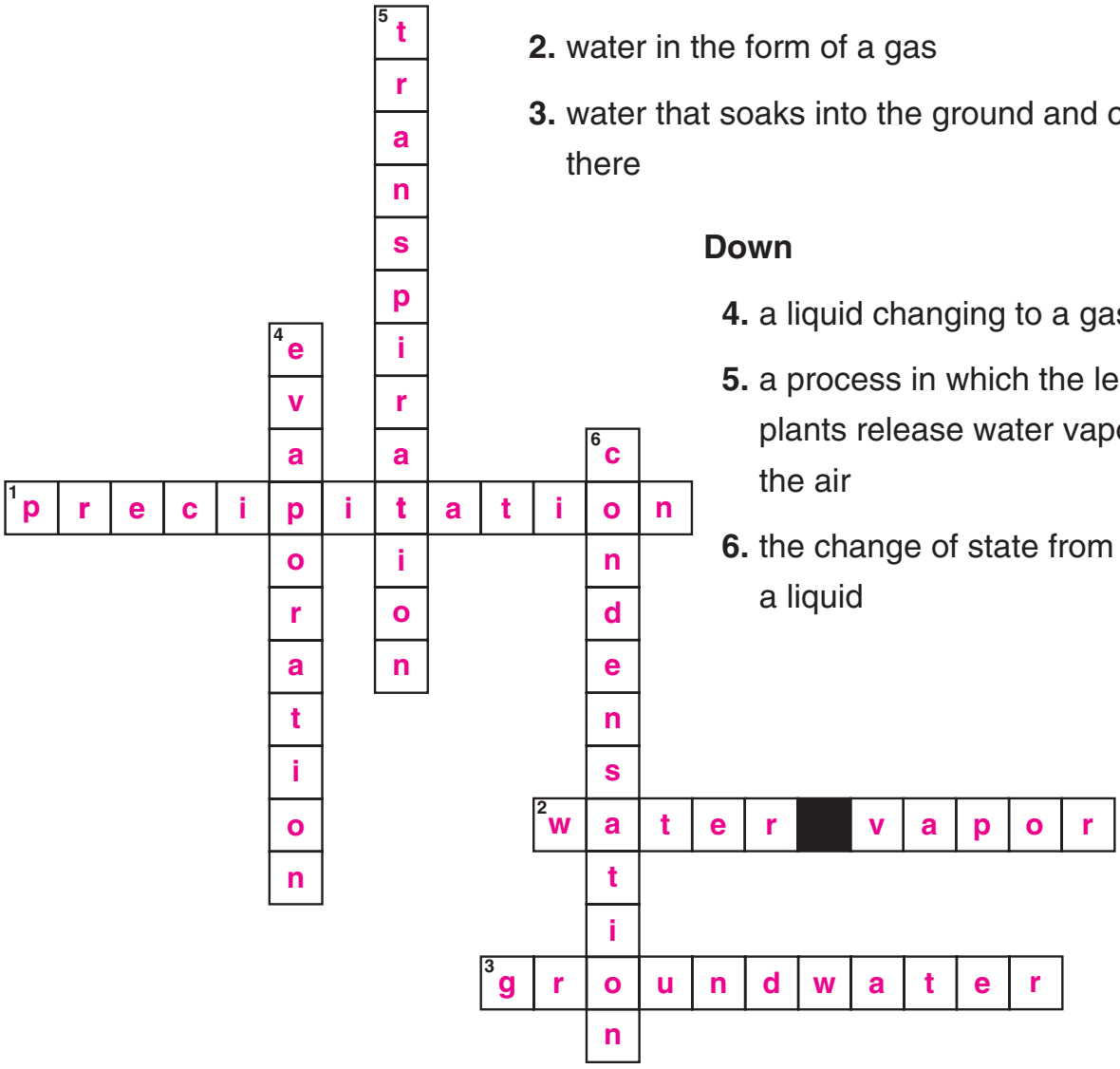
**C. Explain how groundwater and runoff are different.**

**Sample response: Groundwater is water that soaks into the ground and collects in underground spaces between soil and rock. In contrast, runoff is water that flows downhill across Earth's surface without sinking into the land below.**

# How Does Water Change State?

| | | |
|---|---|---|
| condensation | evaporation | groundwater |
| precipitation | transpiration | water vapor |

**Use the words from the box to complete the puzzle about the water cycle.**




### Across

1. any form of water that falls to Earth's surface from clouds
2. water in the form of a gas
3. water that soaks into the ground and collects there

### Down

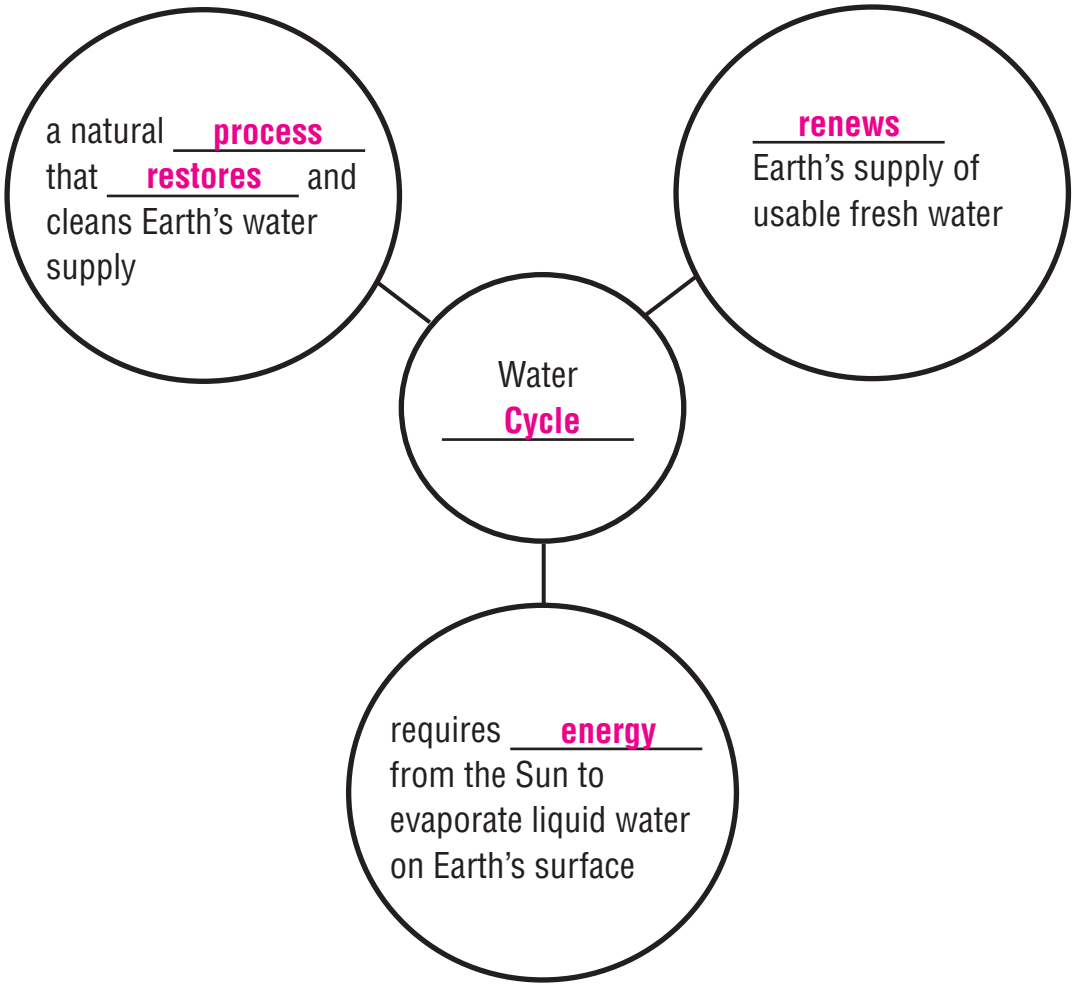
4. a liquid changing to a gas
5. a process in which the leaves of plants release water vapor into the air
6. the change of state from a gas to a liquid

# How Does Water Change State?

## Glossary

| | |
|---|---|
| **cycle** | a series of events that happen one after another in the same order, over and over again |
| **energy** | the capacity for work or vigorous activity |
| **process** | a series of actions performed in making or doing something |
| **renews** | to make new or as if new again |
| **restores** | to bring back into existence or use |

**Use words from the box to complete the diagram about the Water Cycle.**




**Homework:** Write a paragraph that explains how water changes from one state to another in the water cycle.

Name _____ Date _____



# How Does Precipitation Form?

**Main Idea** Clouds form and release precipitation as rain, snow, sleet, and hail.

- As moist air rises, water vapor condenses and clouds can form.
- Luke Howard described four classes of clouds.
- Rain, sleet, snow, and hail are the major forms of precipitation.

**A. Number the events below to show the order in which they occur.**

__4__ The rising warm air gradually cools.

__1__ The Sun warms Earth's surface.

__5__ The cold air sinks back to the ground.

__3__ The warm air rises further above Earth's surface.

__2__ The air just above Earth's surface warms, too.

**B. Complete the diagram about cloud formation.**

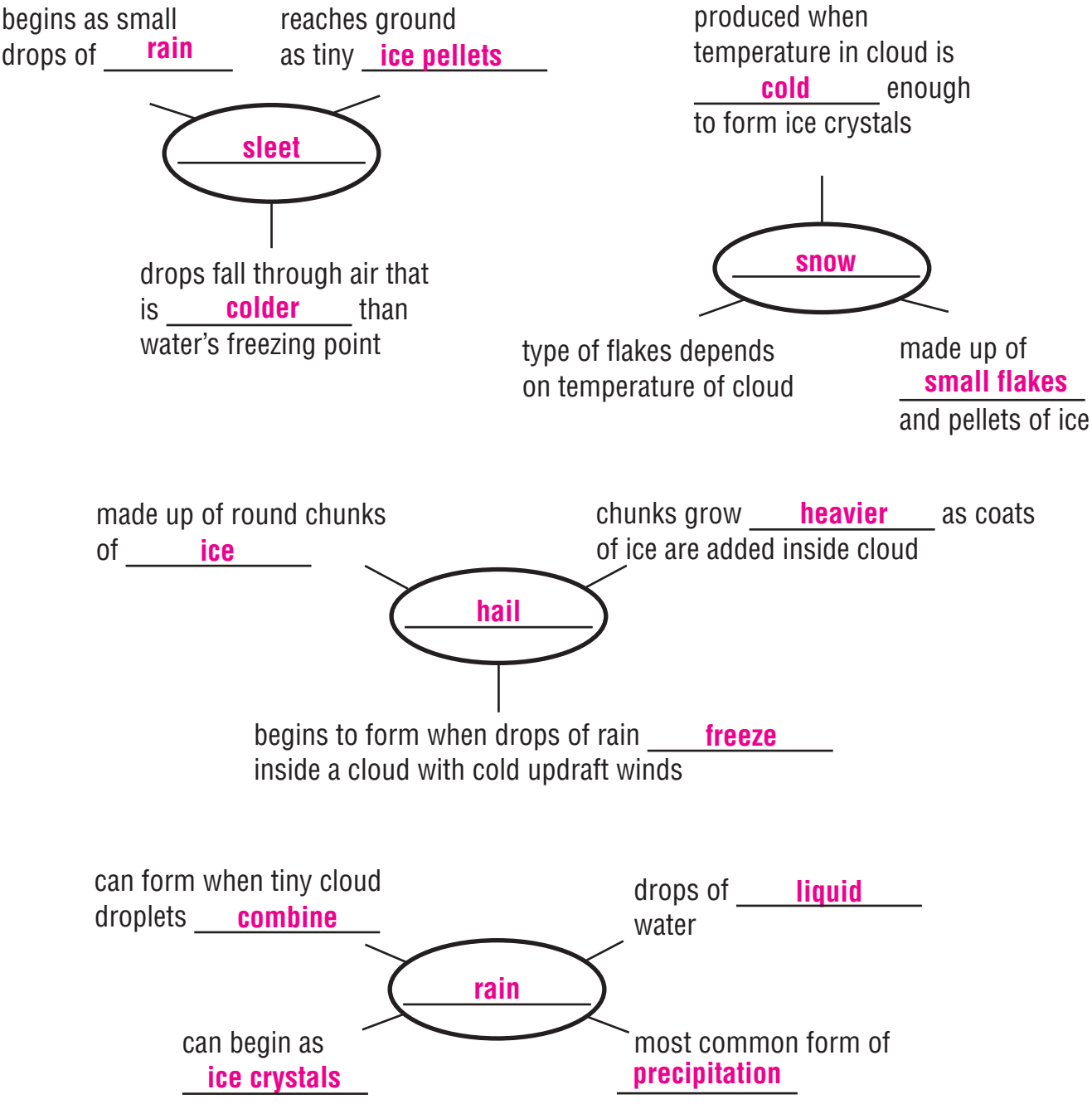
| Causes | Effects |
|---|---|
| Warm air rises in a convection current. | The air carries **water vapor** with it. |
| The air cools. | The water vapor **condenses** around tiny specks of dust or salt, forming tiny **droplets of liquid water**. |
| The droplets remain suspended in the air. | **Clouds form**. |

Name _____ Date _____

B.5.2
Main Idea

# How Does Precipitation Form?

**C. Complete the diagrams to identify the four major forms of precipitation.**



Name _____ Date _____



# How Does Precipitation Form?

convection current dew point
humidity

**Use the words from the box to complete each sentence about precipitation.**

1. The temperature at which air becomes saturated is its **dew point**.
2. **Humidity** is the amount of water vapor in the air at any given time.
3. A **convection current** is a continuous loop of moving air or liquid that transfers energy.
4. If the air temperature drops below the **dew point**, water condenses and clouds or fog form.
5. One reason that **humidity** changes is because the temperature changes.
6. When the **relative humidity** is 100 percent, the air is said to be saturated.

**Vocabulary Skill: Root Words**

The word *humidity* comes from the Latin word *humere*, which means "to be moist." Explain how knowing the meaning of the root helps you understand the meaning of *humidity*.

**Sample response: Humidity is the amount of water vapor in the air, which you can describe as the "moistness" of the air.**




Use with pages 152–159

# How Does Precipitation Form?

## Glossary

| | |
|---|---|
| **cirrus** | a cloud composed of feathery white patches, bands, or streamers of ice crystals, found typically at high altitudes |
| **cumulus** | a dense, white, fluffy cloud that billows upward from a flat base |
| **cumulonimbus** | a very dense cloud with massive projections that billow upward to great heights, usually producing heavy rains, thunderstorms, or hailstorms |
| **stratus** | a low-lying grayish cloud that resembles a layer of fog |

**Use the words from the box to complete the chart about the different types of clouds. Then answer the question that follows.**

| Type of Cloud | Description |
|---|---|
| stratus | These clouds form in layers and may cover large parts of the sky. Some may bring rain. |
| cumulus | These are puffy, white clouds with flat bottoms. They form in rising columns of warm air and generally mean the weather is fair. |
| cirrus | These high altitude clouds are thin and wispy, and made of ice crystals. They indicate that pleasant weather may change to rain. |
| cumulonimbus | These clouds may bring heavy rain or thunderstorms. They may extend up through the troposphere. |

Why do clouds stay in the sky?

Sample response: A cloud is less dense than the air below it, so it floats.

**Homework:** Write a short paragraph describing the types of precipitation that fall in your city or town.

Name _____ Date _____



# How Does the Ocean Affect Weather?

**Main Idea** Oceans have a major effect on Earth's weather and climate.

- Earth's oceans warm and cool more slowly than its lands because water has a relatively high specific heat capacity.
- Ocean currents move warm and cold water around the oceans, helping to even out Earth's temperatures.
- Oceans help to moderate the climate of places near them, such as California.

**A. Complete the summary about heating and cooling land and water.**

The **specific heat capacity** is the amount of energy it takes to raise the temperature of 1 gram of a material by 1°C. Land and water have different specific heat capacities. In general, land heats up **faster** and reaches **higher** temperatures than do bodies of water. Land areas also lose heat **more quickly** and drop to **lower** temperatures. As a result, it takes more **energy** and **time** to heat ocean water than it does to heat nearby land.

**B. Put a check next to each description of surface ocean currents that is true.**

_____ move vertically within ocean

✔ can be warm or cold

_____ form because of differences in water temperature and salinity

✔ move in great circles

✔ driven by surface winds and the effects of Earth's rotation

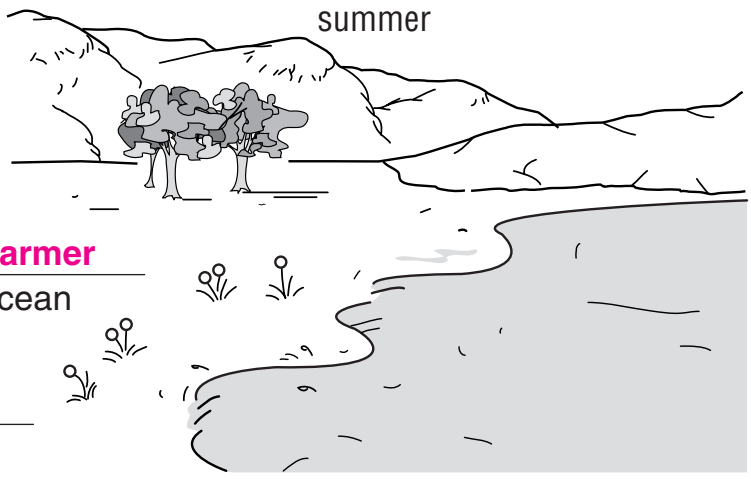
✔ help balance temperatures at Earth's surface

Name _____ Date _____



# How Does the Ocean Affect Weather?

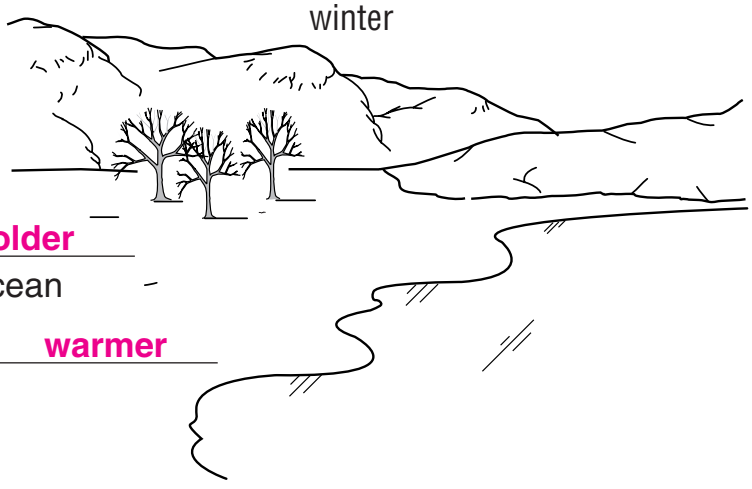
**C. Fill in the blanks to tell how oceans help to moderate the climate of places near them.**




land is **warmer** away from ocean

coastland is **cooler**

Ocean water holds winter's coldness longer than land.




land is **colder** away from ocean

coastland is **warmer**

Ocean water holds summer heat longer than land.

Name _____ Date _____



# How Does the Ocean Affect Weather?

ocean current

**Rewrite each sentence to make the statement about the movement of ocean water true.**

1. An ocean current is an area of cold water in the ocean.

   **An ocean current is a moving stream of water in the ocean.**

2. Water that flows within a current has a wide range of temperatures and densities.

   **Water that flows within a current has similar temperature and density.**

3. Ocean currents move cold water around Earth's oceans. This helps cool the temperature of nearby land.

   **Ocean currents move hot and cold water around Earth's oceans.**

   **This helps moderate temperatures of nearby land.**

4. There are three types of ocean currents—shallow currents, salty currents, and wave currents.

   **There are two types of ocean currents—surface currents and deep currents.**

**Vocabulary Skill: Multiple-Meaning Words**

**The word *current* has more than one meaning. Write a sentence with the word *current* using the same meaning that is found in the lesson.**

**Write another sentence using a different meaning.**

**Sample response: We didn't go swimming at the beach because the current was too strong.**

**Samantha needs to give me her current address.**

# How Does the Ocean Affect Weather?

## Glossary

| | |
|---|---|
| **energy** | the capacity for work or vigorous energy |
| **land** | any part of Earth's surface that is not water |
| **ocean** | the whole body of salt water that covers nearly three-fourths of Earth's surface |
| **temperature** | the degree of heat or cold |
| **warm** | somewhat hot; not cold |

**Use a word from the box to complete the paragraph about ocean effects on weather and climate.**

How much **energy** does it take to raise the **temperature** of 1 gram of water by 1°C? The term used to describe this amount is specific heat capacity. Water and **land** have different specific heat capacities. In general, land heats up faster and cools faster than bodies of water do. For this reason, oceans hold the heat of summer long into winter. During winter, the **ocean** warms nearby lands, which remain milder than they would if the ocean were not there. Oceans also hold the coldness of winter into the **warm** months of summer. During summer, the ocean cools nearby lands.

**Homework:** Define an **ocean current**. Tell where warm currents move warm ocean water and where cold currents move cold ocean water.

Name _____ Date _____

C.6.1
Main Idea

# How Does Air Pressure Affect Weather?

**Main Idea** Earth's atmosphere is a mixture of gases that surrounds the planet. The atmosphere exerts a pressure that decreases with distance above Earth's surface.

- Earth's atmosphere is made up mostly of nitrogen and oxygen.
- Air pressure is the force air exerts on Earth. Air pressure at Earth's surface is always changing.
- Low-pressure systems are associated with changing weather. High-pressure systems are associated with fair weather.

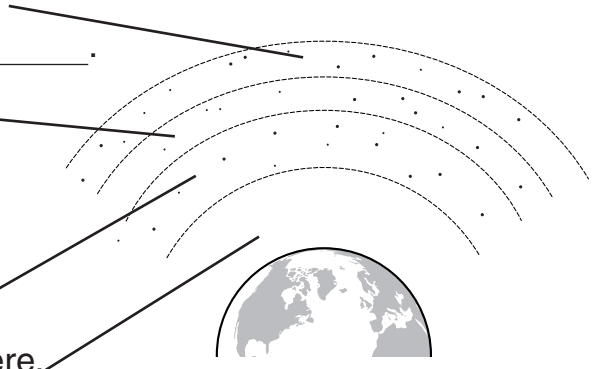
**A. Fill in the blanks to tell about the different layers of Earth's atmosphere.**

The **thermosphere** is the first part of Earth's atmosphere struck by **sunlight**.

The top of the **mesosphere** has the **coldest** temperatures in Earth's atmosphere.

The **stratosphere** contains most of the **ozone** in Earth's atmosphere.

The **troposphere** contains about 75 percent of the **air** in Earth's atmosphere.



**B. Fill in the blanks to tell about air pressure and altitude.**

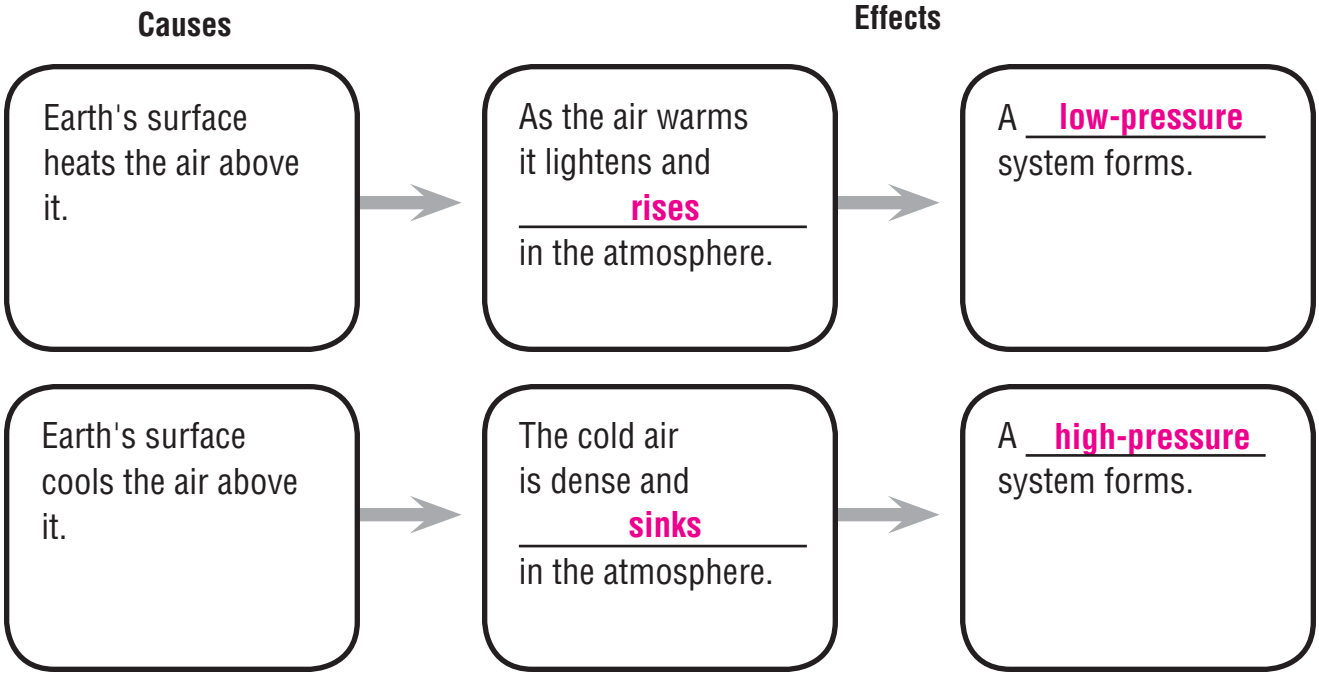
1. The air pressure in the **troposphere** is greater than the air pressure in any other layer in the atmosphere.
2. As the distance from Earth's surface increases, the air pressure **decreases**.
3. Air pressure decreases with altitude because there are **fewer** air molecules as you move away from Earth's surface.

Name _____ Date _____



# How Does Air Pressure Affect Weather?

**C. Complete the diagram to tell how air pressure systems form in Earth's atmosphere.**




**D. Rewrite each sentence to make the statement about air pressure and weather true.**

1. Clouds can form as warmer, lighter air rises in the atmosphere, which is why high-pressure systems are associated with unsettled weather.

   Clouds can form as warm air rises in the atmosphere, which is why low-pressure systems are associated with unsettled weather.

2. Low-pressure systems are associated with fair weather because clouds cannot form when cooler, heavier air sinks in the atmosphere.

   High-pressure systems are associated with fair weather because clouds cannot form when cooler, heavier air sinks in the atmosphere.

Name _____ Date _____



# How Does Air Pressure Affect Weather?

air pressure  atmosphere  weather

**Write the word from the box next to its description. The words will be used more than once.**

air pressure **1.** the force exerted by air on a given area

weather **2.** overall condition of the atmosphere at a given time and place

weather **3.** affected by factors such as humidity, wind speed, and temperature

atmosphere **4.** it's divided into four main layers

weather **5.** affected by the air pressure in a given area

atmosphere **6.** a mixture of gases that surround the planet

air pressure **7.** it generally decreases with altitude

atmosphere **8.** made up mostly of nitrogen and oxygen

air pressure **9.** an effect of the Sun's uneven heating of Earth's surface

**Homework:** Write a short paragraph describing how high-pressure and low-pressure systems affect the weather.

# How Does Air Pressure Affect Weather?

## Glossary

| | |
|---|---|
| **axis** | a straight line around which an object rotates |
| **force** | a push or a pull |
| **fossil fuels** | fossil materials that burn, such as coal, oil, or natural gas |
| **molecules** | groups of two or more atoms linked together |
| **radiation** | energy in the form of electromagnetic waves or particles |
| **water vapor** | water in its gaseous state |

**Use a word from the box to complete each sentence.**

1. Near oceans or large lakes, **water vapor** can make up as much as four percent of the air.

2. Burning **fossil fuels** increases the amount of carbon dioxide in the atmosphere.

3. **Radiation** from the Sun can harm living things.

4. As you move away from Earth's surface, there are fewer air **molecules**.

5. Air exerts a(n) **force** equally in all directions.

6. As Earth revolves around the Sun, the tilt of its **axis** affects the heating of Earth's surface.

**Homework:** Write a paragraph that explains how the tilt of Earth's axis affects the heating of its surface by the Sun.

Name _____ Date _____



# Why Does Air Move?

**Main Idea** Wind is caused by differences in air pressure. These differences create both local winds and planetary winds.

- Wind is the movement of air from areas of high pressure to areas of low pressure.
- All winds are part of convection currents in the atmosphere.
- Planetary winds affect large areas of Earth.

**A. Complete the paragraph to tell about air pressure.**

The ___uneven___ heating of Earth's surface causes differences in ___air pressure___. When air is warmed, it becomes ___less dense___ than surrounding air. When air is ___cooled___, it becomes denser than the surrounding air. This creates local high-pressure and low-pressure systems that affect ___weather___ across the globe.

**B. Answer the following questions to compare the different types of local breezes.**

1. What are valley breezes?
   Valley breezes are local winds that occur during the day as cooler air over the valley replaces the rising warmer air over mountain slopes.
2. What are land breezes?
   Land breezes are local winds that occur at night when cooler air from the land moves in to replace the rising warmer air over the sea.

Name _____ Date _____



# Why Does Air Move?

**C. Number the statements in the correct order to tell about the mountain effect.**

7 Dry winds sweep down the leeward side of the mountain.

4 In the colder air at higher elevations, water vapor condenses to form clouds.

1 Water from the ocean evaporates into water vapor in the air.

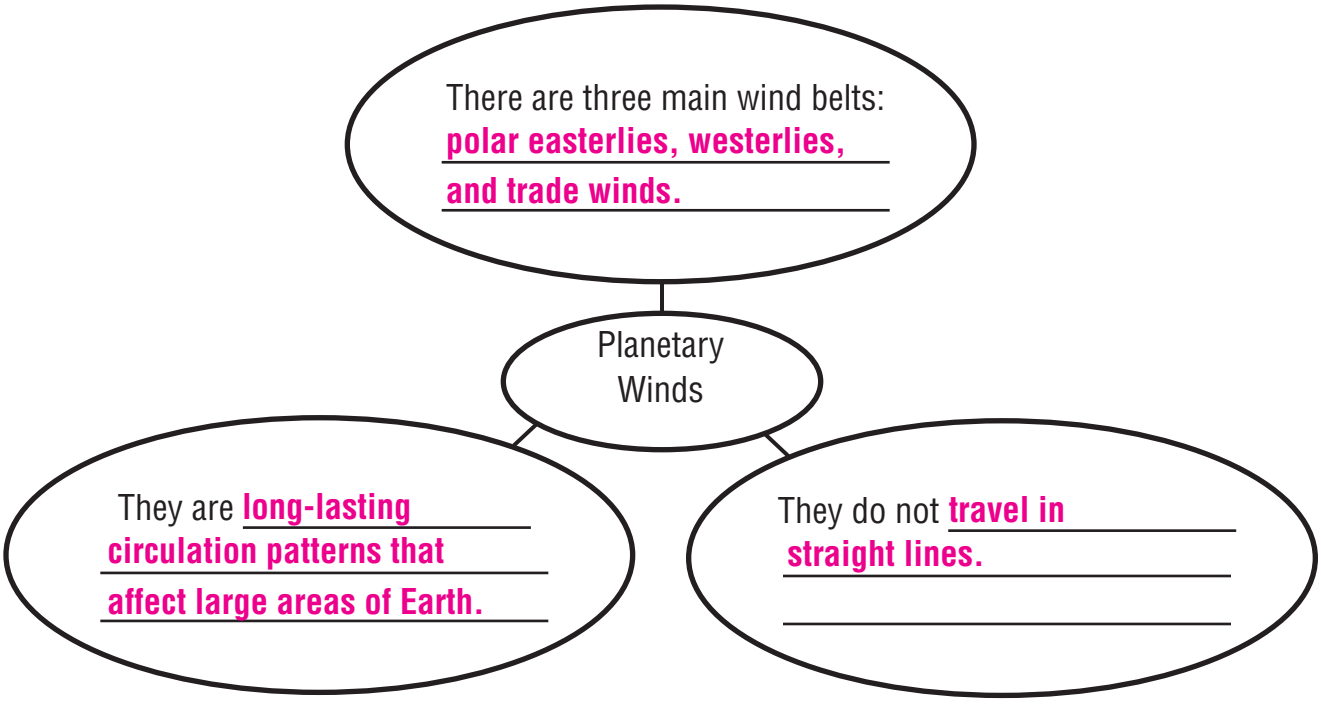
6 Air that crosses over the mountain has very little moisture left.

2 Sea breezes carry the moist air toward land.

5 Rain or snow may fall along the windward side of the mountain.

3 Moist air is forced up over the mountains.

**D. Complete the diagram to tell about planetary winds.**




**Homework:** Write a paragraph explaining how the jet stream and planetary wind belts affect weather systems.

Name _____ Date _____



# Why Does Air Move?

| | | |
|---|---|---|
| jet stream | land breeze | mountain breeze |
| valley breeze | sea breeze | planetary winds |

**Rewrite the underlined portion of each statement to make it true.**

1. A mountain breeze occurs during the day when warm air rising from a mountain slope is replaced by cooler air from the valley moving in to replace it.

   **at night when cooler air from mountain slopes flows down the slopes to replace warm air rising above the valley.**

2. Planetary winds, like local breezes, are regional winds that affect a limited area of Earth.

   **unlike local breezes, are long-lasting circulation patterns that affect large areas of Earth.**

3. A land breeze occurs during the day when cool air from the sea moves in to replace warm air rising over the sea.

   **occurs at night when cool air from land moves toward the sea to replace rising warm air over the sea.**

4. Jet streams are the three wind belts in each hemisphere of Earth.

   **fast-moving global winds that occur in the upper troposphere.**

5. A sea breeze blows from water to land and occurs during the day when warm air over the sea moves in to take the place of cool air rising over the land.

   **blows from water to land and occurs during the day when cool air over the sea moves in to replace warm air rising over the land.**

6. A valley breeze occurs at night when cool air from the valley rises up mountain slopes to replace the cool air rising over the slopes.

   **occurs during the day when cool air from the valley rises up mountain slopes to replace the warm air rising over the slopes.**

# Why Does Air Move?

## Glossary

| | |
|---|---|
| **belts** | geographic regions that are distinctive in some way |
| **circulation** | the process of moving or flowing along a path |
| **friction** | the rubbing of one object or surface against another |
| **global** | of the entire Earth; worldwide |
| **prevailing** | most common |

**Use words from the box to complete the paragraph to tell about global weather.**

The uneven heating by the Sun of Earth's surface creates differences in air pressure. These differences in air pressure result in planetary winds. Planetary winds are long-lasting **circulation** patterns that affect large areas of Earth. Three main wind **belts** cover each hemisphere. These winds do not travel in straight lines. They are directed by Earth's rotation and **friction** with the surface. Planetary winds curve to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

Jet streams are another system of **global** winds occurring in the troposphere. Planetary winds and jet streams affect the direction in which weather systems move. For example, the **prevailing** westerlies blow from west to east across the United States. They have a great effect on U.S. weather.

**Vocabulary Skill: Prefixes**

**The prefix *un-* means "not." It usually changes a word to its opposite meaning. Determine the meaning of each word and then write a sentence using each word.**

uneven: **not even, not straight, not level**

unequal: **not equal, not the same, not even**

Name _____ Date _____



# How Are Weather Forecasts Made?

**Main Idea** Scientists gather data about temperature, humidity, wind, and air pressure. They use this information to develop weather forecasts.

- Weather involves different variables, including temperature, humidity, wind, and air pressure, interacting in the atmosphere.
- Air masses form in the troposphere and create fronts where they meet, along which changes in weather occur.
- Different kinds of technology are used to predict the weather, including radar, weather satellites, and weather balloons.

**A. Match the instrument to the weather variable it is used to measure.**

| | | |
|---|---|---|
| c | **1.** wind vane | **a.** temperature |
| d | **2.** barometer | **b.** wind speed |
| a | **3.** thermometer | **c.** wind direction |
| b | **4.** anemometer | **d.** air pressure |

**B. Answer the questions to tell about air masses and fronts.**

**1.** What factor affects the temperature and moisture of an air mass?

The temperature and moisture of an air mass depend on where the mass forms.

**2.** What are the four main types of air masses that affect weather in North America?

The four main types of air masses are maritime polar, continental polar, maritime tropical, and continental tropical.

**3.** How do air masses affect weather?

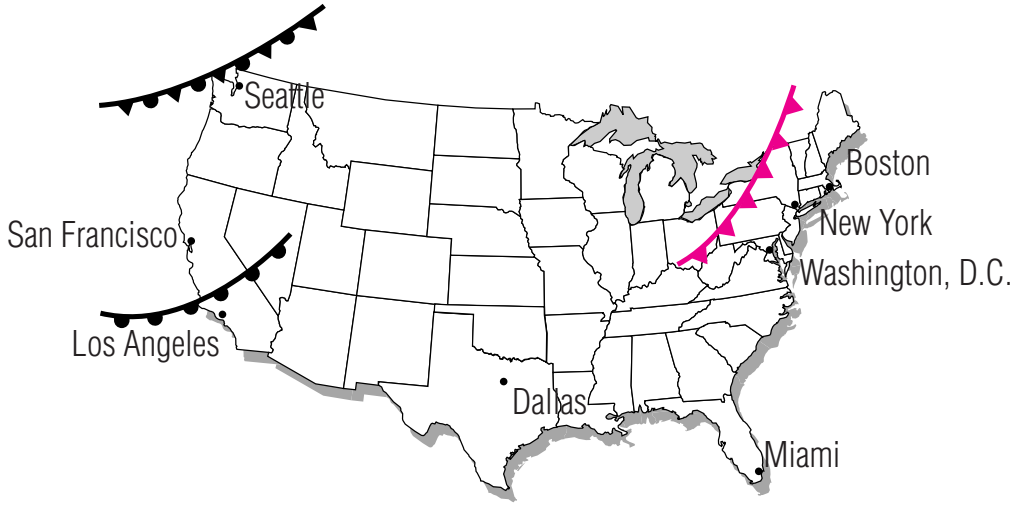
Air masses of different temperatures and humidity form fronts where they meet. Changes in weather usually occur along these fronts.

Name _____ Date _____

C.6.3
Main Idea

# How Are Weather Forecasts Made?

**C. Answer the following questions about weather maps.**




1. A high-pressure system is pushing a cold front across the Northeast from Boston to Washington, D.C. Draw the front on the map. What kind of weather would you expect to find in New York today? Tomorrow?

   **Expect heavy rain with thunderstorms today and clear skies tomorrow.**

2. Is it warmer in San Francisco or Los Angeles? How can you tell?

   **It is warmer in San Francisco because air behind a front is warmer than air ahead of the front.**

**D. Fill in the blanks to complete the paragraph about predicting the weather.**

**Meteorologists** use different tools to study the weather. **Radar** is used to create images of storms using **radio signals** that bounce off different kinds of precipitation. Weather balloons are used to study weather conditions in **the upper atmosphere**. Meteorologists then use the data they have collected to make **predictions** about the weather.

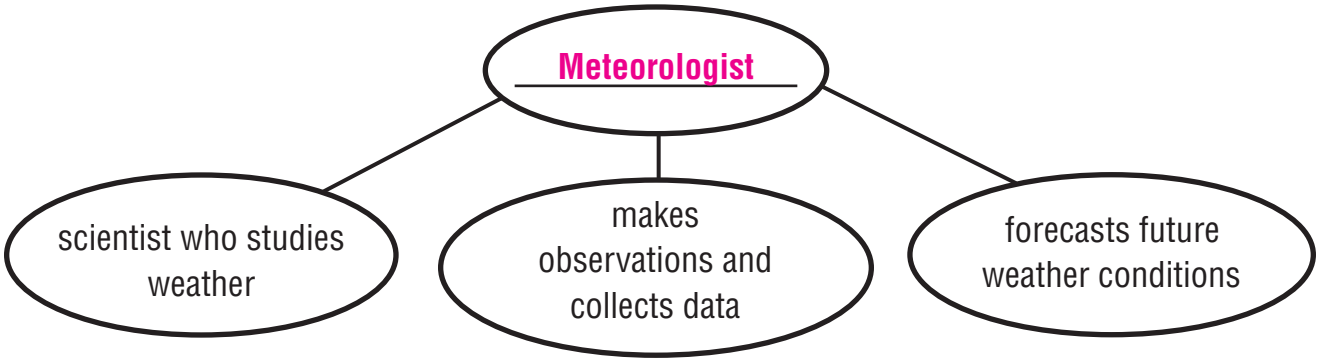
Name _____ Date _____

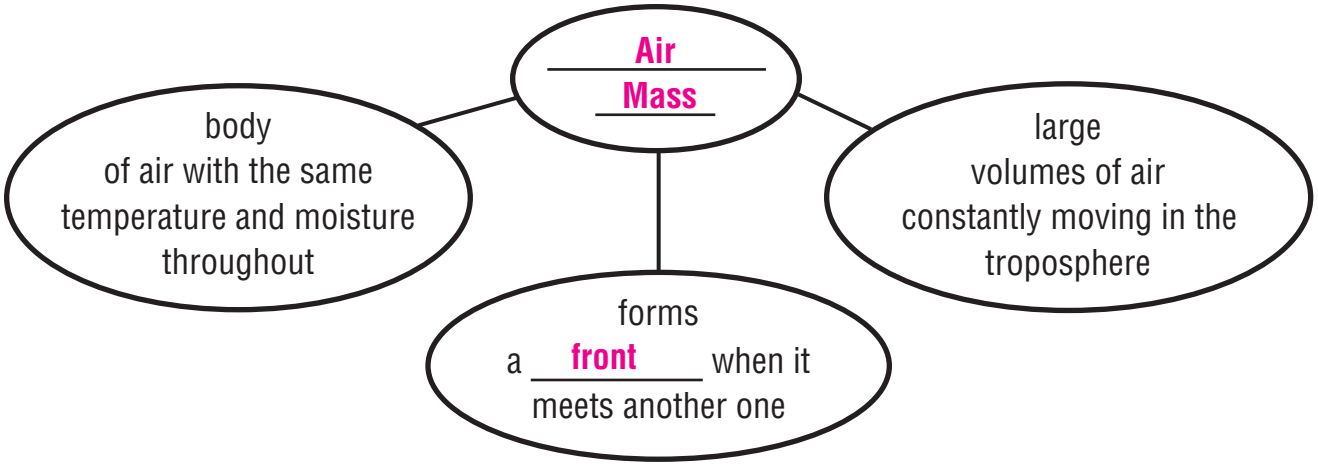


# How Are Weather Forecasts Made?

air mass front meteorologist

**Use the words from the box to complete the diagrams.**




**Vocabulary Skill: Multiple-Meaning Words**

**Many words in the English language have more than one meaning. Write two sentences that use different meanings of the word *front*.**

1. Cara is meeting her father in front of her school at 3:30.

2. The weather forecaster said that a cold front with heavy rains will come to our area tomorrow.

# How Are Weather Forecasts Made?

## Glossary

| | |
|---|---|
| **continental** | relating to a continent |
| **forecast** | prediction |
| **maritime** | located on or near the sea |
| **polar** | relating to, or near, the North Pole or the South Pole |
| **tropical** | relating to the tropics |
| **variables** | things that change or are subject to change |

**Use the words from the box to answer the following questions.**

**1.** What does the weather depend on?

**variables**

**2.** What kind of air mass is generally cold?

**polar**

**3.** What kind of air mass tends to form over water and is moist?

**maritime**

**4.** What does a meteorologist make after gathering data about the weather?

**forecast**

**5.** What kind of air mass is generally dry?

**continental**

**6.** What kind of air mass forms at low latitudes and is generally warm?

**tropical**

Name _____ Date _____

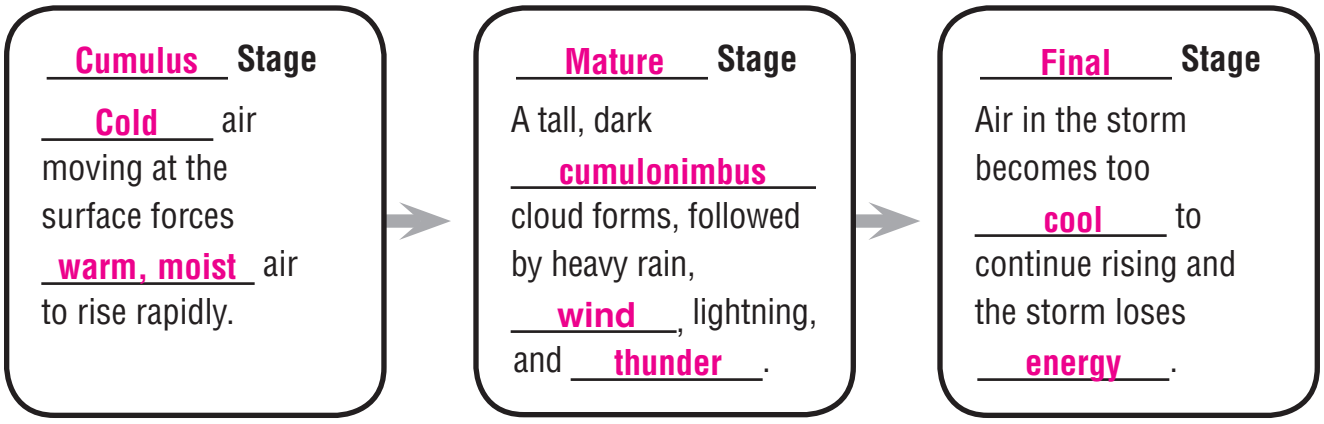


# What Causes Storms?

**Main Idea** Severe storms are associated with low-pressure systems. In these systems, warm, moist air rises and cools. Water vapor in the cooling air condenses, forming clouds followed by precipitation.

- Thunderstorms bring strong winds, heavy rains, lightning, and thunder. Tornados can develop from thunderstorms.
- Blizzards are severe snowstorms with heavy snow, high winds, and low temperatures.
- Hurricanes are the most powerful storms on Earth. They form over warm ocean waters in the tropics.

**A. Complete the diagram to tell about how thunderstorms form. Then answer the question that follows.**




What three conditions must be met for a thunderstorm to form?

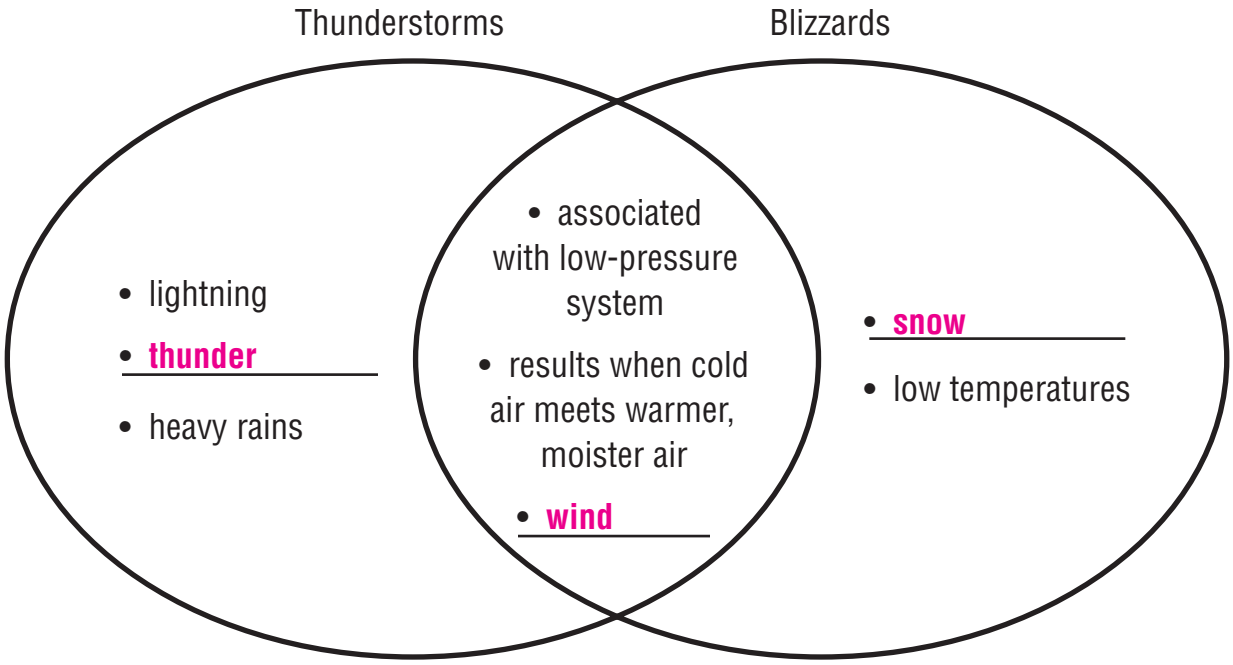
Sample response: There must be plenty of moisture in the air; there must be an approaching cold front (or extreme heating of the surface); and the rising air must remain warmer than the surrounding air.

Name _____ Date _____



# What Causes Storms?

**B. Complete the diagram to tell how thunderstorms and blizzards are similar and different.**




**C. Fill in the blanks to tell about the formation of a hurricane.**

1. A hurricane begins as a ___low-pressure___ system over warm, tropical waters.
2. As the system strengthens, ___thunderstorms___ begin to rotate around the area of low pressure.
3. As warm, moist air continues to rise, pressure in the center of the system ___falls steadily___ as the storm strengthens.
4. The hurricane continues to grow in ___size___ and ___intensity___ while it moves over warm, tropical waters.
5. The hurricane will weaken and lose energy when it moves over ___cooler___ water or moves over ___land___.

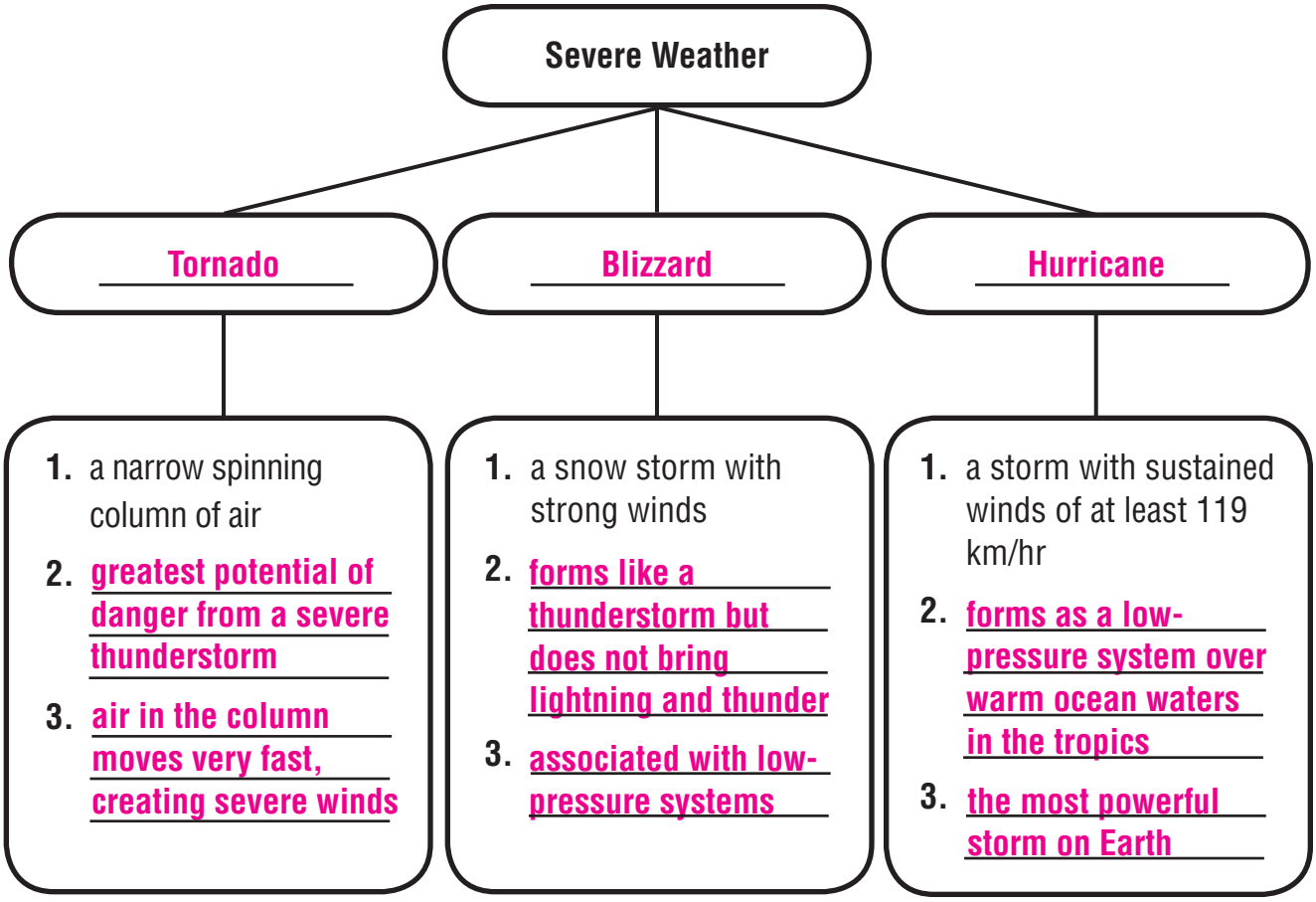
Name _____ Date _____



# What Causes Storms?

blizzard hurricane thunderstorm tornado

**Use a term from the box to complete this diagram about severe weather. Then add two more facts about each type of weather to the diagram.**




**Homework:** Write a paragraph describing how a thunderstorm forms.

# What Causes Storms?

## Glossary

| | |
|---|---|
| **condenses** | changes from a gas to a liquid |
| **discharge** | a release of electrical energy |
| **intensity** | extreme force or strength |
| **moisture** | wetness |
| **reserves** | things kept back or saved for later use |
| **visibility** | the greatest distance over which it is possible to see without aid from instruments |

**Use the words in the box to complete the following sentences.**

1. Clouds form when moisture in warm rising air _____condenses_____.
2. In order for a thunderstorm to form, there must be plenty of _____moisture_____ in the air.
3. Lightning is a powerful electric _____discharge_____ that can occur during a thunderstorm.
4. Droughts can kill crops and drain away water _____reserves_____.
5. Moving about in a blizzard is difficult because _____visibility_____ is low.
6. A hurricane continues to grow in size and _____intensity_____ while over warm, tropical waters.

Name _____ Date _____



# What Is Earth's Sun Like?

**Main Idea** The Sun is the largest and most massive body in the solar system. It provides nearly all the energy needed to sustain life on Earth.

- The Sun is a medium-sized yellow star. It is the central body of the solar system.
- The Sun is made mostly of hydrogen and helium and produces energy by nuclear fusion.
- The Sun is a main sequence star. It will eventually pass through the phases of red giant, planetary nebula, white dwarf, and black dwarf.

**A. Complete the outline to tell about the Sun and its surface features. Then answer the question that follows.**

I. The Sun

**A.** a medium-sized **yellow star**

**B.** located about **150 million km** from Earth

**C.** exerts a strong **gravitational pull**

**D.** main source of **energy** for Earth

II. The Sun's Surface Features

**A.** **Sunspots** are cooler areas on the Sun's surface that occur in 11-year cycles.

**B.** **Solar flares** are powerful eruptions of particles on the Sun's surface.

**C.** **Solar winds** are fast-moving gases that can travel in space.

**D.** **Solar prominences** are huge arcs of gas that extend high into the Sun's atmosphere.

Why do solar flares and prominences occur in 11-year cycles?

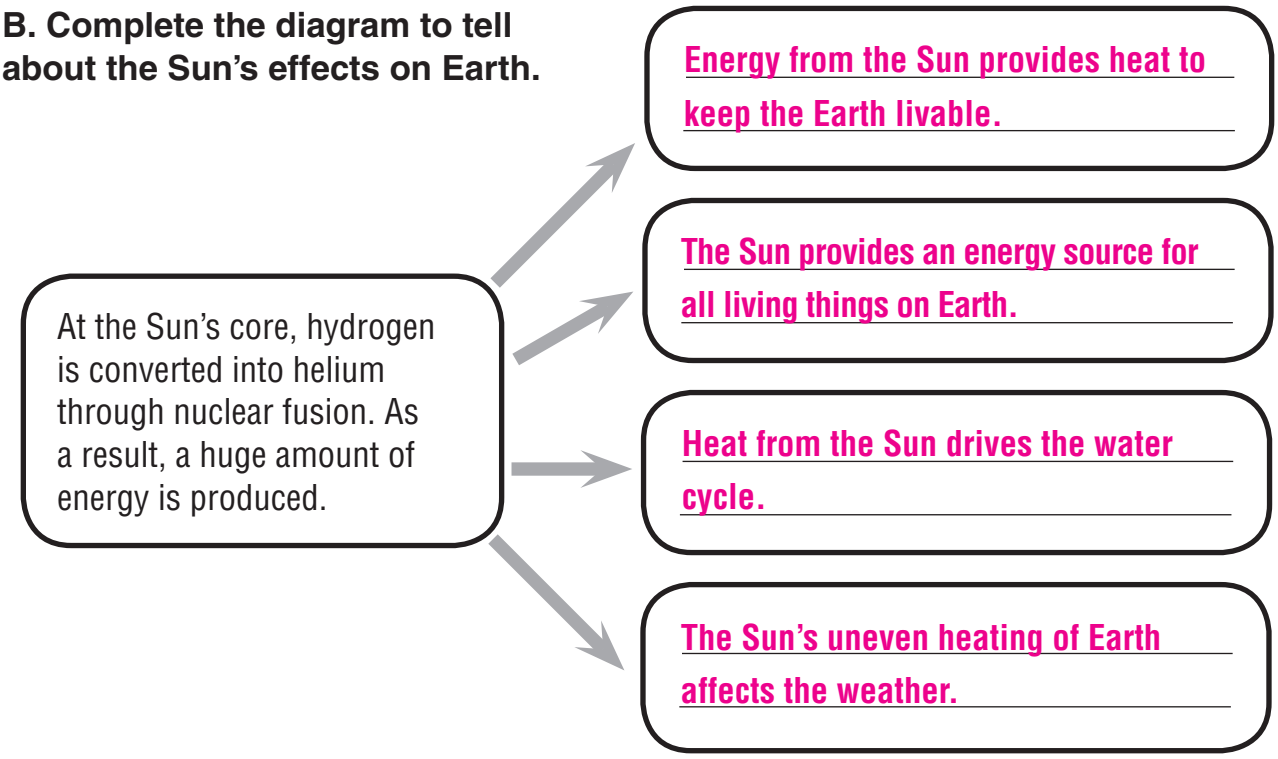
**Sample response: Both solar flares and prominences are common during high sunspot activity. Since sunspots occur in 11-year cycles, so do solar flares and prominences.**

Name _____ Date _____



# What Is Earth's Sun Like?

**B. Complete the diagram to tell about the Sun's effects on Earth.**




**C. Fill in the blanks to tell about the life cycle of a star. Then number the statements to show the correct sequence.**

6 Over time, the star shrinks into a white dwarf.

4 The outer part of the star expands over time, while the core contracts. The star is known as a red giant.

7 Out of nuclear fuel, the star eventually fades into a black dwarf.

1 A star forms from rotating clouds of dust and gas called a nebula.

5 A planetary nebula forms when the outer layers of the star are released.

3 Nuclear fusion begins when temperatures reach 10 million °C and a star is born.

2 In a protostar, gravity and other forces cause the nebula to collapse. Clouds begin to glow as the temperature rises.




Use with pages 236–243

Name _____ Date _____

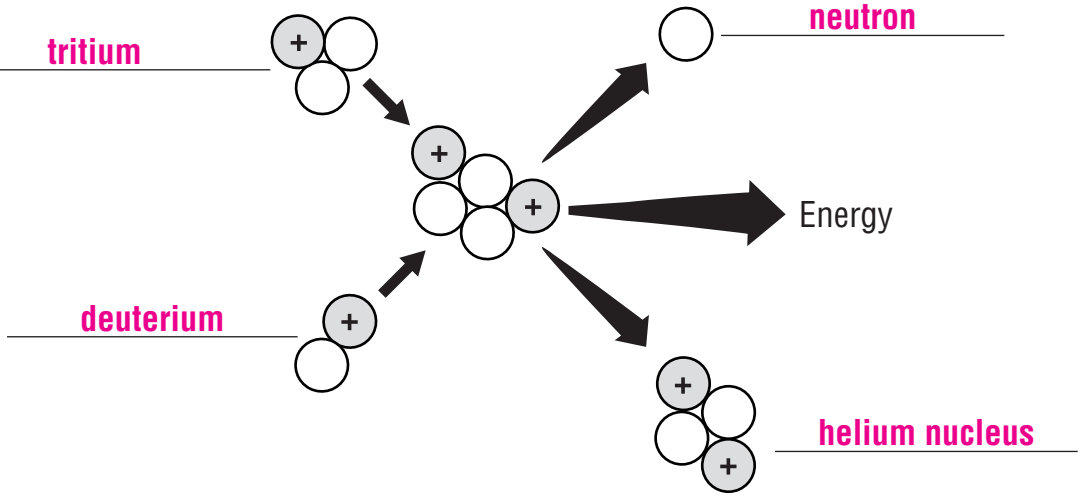


# What Is Earth's Sun Like?

nuclear fusion  sunspots

**A. Complete the paragraph to tell about stars. Then label the diagram.**

The Sun is the central body of the solar system. Like all **stars**, the Sun produces energy by **nuclear fusion**. In this process, the nuclei of two forms of **hydrogen** (tritium and deuterium) fuse, or combine, to form a helium nucleus and a neutron. A tremendous amount of **energy** is produced in this process from a small amount of **matter** .




**B. Complete the sentences to tell about sunspots.**

1. Sunspots are **dark areas on the Sun's surface** .
2. They appear dark because **they are cooler than surrounding areas** .
3. Sunspots occur in cycles that **reach a peak roughly every 11 years** .
4. Periods of low and high sunspot activity correspond to **temperature changes on Earth** .

Name _____ Date _____



# What Is Earth's Sun Like?

## Glossary

| | |
|---|---|
| **collapse** | to fall downward or inward suddenly |
| **correspond** | to match |
| **disrupt** | to throw into confusion or disorder |
| **evaporate** | to change from a liquid to a gas |
| **stabilized** | kept from changing |

**Use the words from the box to complete the paragraph about the Sun.**

All stars form from enormous rotating clouds of dust and gases. Over time, gravity and other forces cause the clouds to **collapse** into a very dense mass. When temperatures in this dense mass reach at least 10 million °C, nuclear fusion begins. A star is born. When a newly formed star has **stabilized**, it becomes a main–sequence star, like the Sun.

The Sun affects life on Earth. Sunspots are dark areas on the Sun's surface. Periods of low and high sunspot activity **correspond** to temperature changes on Earth. Solar flares are powerful eruptions of particles that shoot into space. When particles released in solar flares reach Earth, they can **disrupt** radio communications. In addition, the Sun drives the water cycle. It causes water on Earth's surface to **evaporate**, forming water vapor.

**Vocabulary Skill: Antonyms**

**An antonym is a word that means the opposite of another word. Find an antonym for these words. Use the text from the lesson to help you.**

evaporate: **condense**

contract: **expand**

Name _____ Date _____



# What Orbits the Sun?

**Main Idea** The Sun and the bodies that revolve around it make up the solar system. The solar system is a small part of a much larger system called the Milky Way galaxy.

- The solar system consists of the Sun, nine planets, their moons, and many other smaller bodies that orbit the Sun.
- All but two planets in the solar system have at least one moon. Moons and asteroids are among the smaller bodies in the solar system.
- Comets may have short-period or long-period orbits around the Sun. Meteors are bits of matter that burn up when they enter Earth's atmosphere.

**A. Complete the summary about the formation of the solar system.**

Scientists think that the solar system is about **4.6 billion years** old. It formed from a hot, spinning cloud of **gases and dust**. Over time, **gravity** caused the center of the cloud to collapse. **Heat and pressure** built up in the center and **the Sun** was formed.

Away from the center, temperatures were much **cooler**. Matter there began to come together to form **the nine planets** and their **moons**. Planets closest to **the Sun** formed from heavy, **rocky** material. Planets farther away were able to hold onto lighter **gases** and became much **larger**. Along with the planets and their moons, other smaller bodies formed, such as **asteroids**, **comets**, and **meteoroids**.

The paths, or **orbits**, of all these bodies are shaped like slightly flattened circles, called **ellipses**. The strong **gravitational** force of the Sun holds all the objects in the solar system in their orbits.

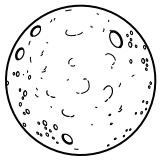
Name _____ Date _____



# What Orbits the Sun?

**B. Fill in the blanks to tell about moons, asteroids, comets, and meteors.**

## Moons

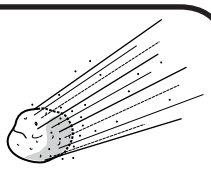


1. natural satellite
2. held in gravitational pull by their planets
3. some have atmospheres and active volcanoes
4. others show evidence of ice and water

## Asteroids

1. small, rocky objects that orbit the Sun
2. most orbit in an asteroid belt between Mars and Jupiter
3. range widely in shape and size

## Comets



1. made up of dust, ice, and frozen gas
2. contain a solid center called the nucleus
3. gases and dust released from the nucleus when close to the Sun, forming a glowing region called a coma
4. form a tail that can reach out millions of kilometers into space

## Meteors

1. begin as chunks of rock and metal called meteoroids
2. enter Earth's atmosphere and are heated by friction with the air
3. burn up as they fall to Earth, appearing as streaks of light in the night sky

Name _____ Date _____



# What Orbits the Sun?

| | | | |
|---|---|---|---|
| asteroid | comet | galaxy | meteor |
| meteoroid | planet | solar system | |

**Vocabulary Skill:**
**Sentence Context**

**Use a word from the box to complete each sentence.**
**Use context clues to help you.**

1. A(n) _____**meteor**_____ is a chunk of matter that is heated by friction with air as it falls through Earth's atmosphere.

2. A(n) _____**comet**_____ is a small body made up of dust, ice, and frozen gases.

3. A(n) _____**planet**_____ is a large body that revolves around the Sun.

4. A(n) _____**meteoroid**_____ is a chunk of rock or metal that can sometimes fall into Earth's atmosphere.

5. A(n) _____**asteroid**_____ is a small, rocky object that orbits the Sun.

6. A(n) _____**galaxy**_____ is a huge system of gas, dust, and stars.

7. The _____**solar system**_____ is the Sun and all the bodies that travel around it.

**Homework:** Write a paragraph that includes five facts about the objects in the solar system.

Name _____ Date _____

# What Orbits the Sun?

## Glossary

| | |
|---|---|
| **collided** | bumped together violently |
| **orbit** | to move around another object |
| **revolves** | orbits around a central point |
| **rotates** | turns around on an axis |
| **vaporize** | to change from a liquid to a gas |

**Use the words in the box to complete each sentence about objects in the solar system.**

1. The Moon _____**rotates**_____ on its axis and _____**revolves**_____ around Earth.

2. Some scientists believe that asteroids are remnants of several planets that _____**collided**_____ and broke apart.

3. When a comet approaches the Sun, frozen solids in its nucleus _____**vaporize**_____.

4. Meteors begin as meteoroids, which are bits of rock or metal that _____**orbit**_____ the Sun.

**Vocabulary Skill: Suffixes**

**The suffix *-tion* changes a word to noun form. For each word, write its noun form using *-tion* and then write a definition for the word. Use a dictionary to help you.**

revolve: **revolution; a complete circle made around a central point**

rotate: **rotation; a turning motion around an axis**

Name _____ Date _____

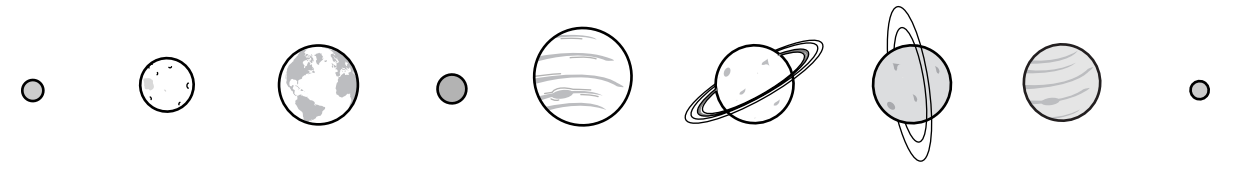


# What Are the Planets Like?

**Main Idea** The four planets closest to the Sun are called the inner planets. The remaining five planets are the outer planets.

- Mercury, Venus, Earth, and Mars are the inner planets. They are small and rocky and have few or no moons.
- Jupiter, Saturn, Uranus, Neptune, and Pluto are the outer planets. With the exception of Pluto, the outer planets are large and gaseous, and have many moons.
- Space probes can be used to explore regions of space that are too difficult or dangerous for humans to explore.

**A. Write the letter of each description under the planet it describes.**



| Mercury | Venus | Earth | Mars | Jupiter | Saturn | Uranus | Neptune | Pluto |
|---|---|---|---|---|---|---|---|---|
| f | c | g | i | h | a | j | e | b |

**a.** a large planet best known for it rings of ice particles

**b.** unlike other outer planets, this planet is small, rocky, and icy

**c.** a planet with a thick atmosphere made mostly of carbon dioxide

**e.** a planet with 11 moons and the coldest surface temperature

**f.** the smallest inner planet, with surface temperatures that vary widely

**g.** the only planet known to have liquid water

**h.** a planet famous for its Great Red Spot

**i.** a planet home to the largest volcano in the solar system

**j.** a planet tilted sharply on its axis with a system of 11 rings

Name _____ Date _____



# What Are the Planets Like?

**B. Rewrite each statement comparing the inner and outer planets to make it true.**

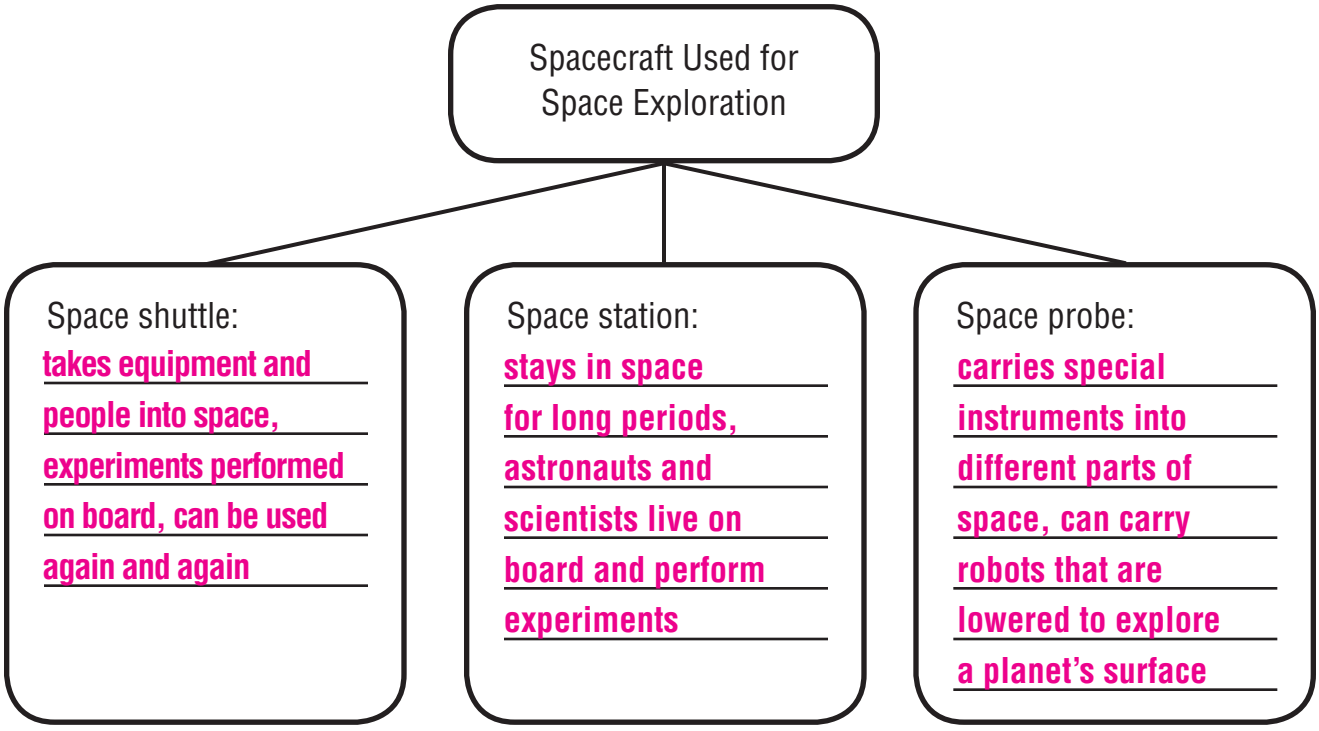
1. The inner planets are large and gaseous, while the outer planets are small and rocky.

   **The outer planets are large and gaseous, while the inner planets are small and rocky.**

2. The outer planets generally have fewer moons than the inner planets.

   **The outer planets generally have more moons than the inner planets.**

**C. Complete the diagram to tell about the three types of spacecraft used by astronomers to explore space.**



Name _____ Date _____



# What Are the Planets Like?

inner planet outer planet

**Answer the questions to tell about inner planets and outer planets.**

1. Which planets make up the inner planets?

   **The inner planets are Mercury, Venus, Earth, and Mars.**

2. What is the relative size of the inner planets?

   **The inner planets are relatively small.**

3. Of what substance are the inner planets mostly composed?

   **The inner planets are mostly composed of rock.**

4. Which planets make up the outer planets?

   **The outer planets are Jupiter, Saturn, Uranus, Neptune, and Pluto.**

5. What is the relative size of the outer planets?

   **The outer planets are relatively large, with the exception of Pluto.**

6. Of what substance are the outer planets mostly composed?

   **The outer planets are mostly composed of gases, with the exception of Pluto.**

**Homework:** Write one paragraph describing the characteristics of an inner planet and one paragraph describing an outer planet.

# What Are the Planets Like?

## Glossary

| | |
|---|---|
| **cratered** | having a surface covered with shallow holes |
| **dense** | having relatively high density |
| **erosion** | the movement of rock material from one place to another |
| **greenhouse effect** | the trapping of the Sun's radiation in a planet's atmosphere |
| **plane** | a flat or level surface |
| **velocities** | speeds |

**Use words from the box to complete the chart about the planets.**

| Planet | Characteristic |
|---|---|
| Mercury | has a heavily ___cratered___ surface, caused by collisions with other objects in space |
| Venus | atmosphere is 96 percent carbon dioxide, creating tremendous pressure and a strong ___greenhouse effect___ |
| Mars | its surface shows sign of water ___erosion___, indicating that it may once have been more like Earth |
| Saturn | the least ___dense___ of any planet |
| Neptune | its winds reach ___velocities___ of 2,700 km/hr |
| Uranus | its axis is tilted so much that it is nearly parallel to the ___plane___ of its orbit |

**Homework:** Write a paragraph that describes interesting characteristics of Earth, Jupiter, and Pluto.

Name _____ Date _____



# What Keeps Planets in Their Orbits?

**Main Idea** The path of a planet around the Sun is caused by the gravitational attraction between the Sun and the planet.

- Gravitation causes objects to fall back to Earth. The strength of the gravitational force depends on the mass of the objects and the distance between them.
- The solar system formed from a cloud of dust and gas called a nebula.
- Planets orbit in curved paths because the forward motion of the planet is balanced by the downward pull of the Sun's gravity.

**A. Answer the following questions to tell about gravitational forces.**

**1.** What is gravitation?

**Sample response: Gravitation is an attractive force between objects that have mass.**

**2.** Why is gravitation an example of a non-contact force?

**Sample response: Gravitation acts on objects at a distance, without touching them.**

**3.** What two factors affect gravitational force?

**Sample response: The masses of the objects and the distance between the objects affect the strength of gravitational force.**

**4.** What effect does mass have on the strength of a gravitational force?

**Sample response: The greater the masses of the objects, the stronger the gravitational force is between them.**

**5.** What effect does distance have on the strength of a gravitational force?

**Sample response: The smaller the distance between the objects, the stronger the gravitational force is between them.**

Name _____ Date _____

C.7.4
Main Idea

# What Keeps Planets in Their Orbits?

**B. Complete the diagram to tell about the formation of the solar system.**

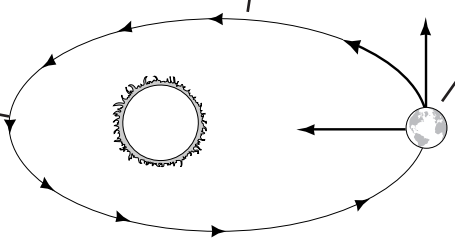
The solar system began as a **cloud** of gas and dust called a **nebula**. The force of **gravity** collapsed the center of this cloud into a star, which became **the Sun**.

The inner planets formed near the Sun, where **temperatures** were very **hot**. Lighter elements were **vaporized** by the intense heat, which is why the inner planets are composed mainly of **heavy elements**.

The outer planets formed **farther** from the Sun, where temperatures were **cooler**. They formed from **ice**, gas, and dust. They grew in **mass** until even the light elements could not escape their **gravitational pull**. This is why the outer planets are made mostly of light elements.

**C. Complete the diagram to tell about the orbits of planets around the Sun.**

**1.** A planet travels in an **elliptical** path around the Sun.



**2.** The **forward** motion of the planet balances the Sun's **gravitational pull** on it, so the planet follows a **curved** path around the Sun.

**3.** The planet **speeds up** as it nears the Sun and **slows down** when it is farther away.

Name _____ Date _____



# What Keeps Planets in Their Orbits?

gravity

**Place a check mark next to all the statements that are true about gravity.**

✔ **1.** It is an attractive force between objects that have mass.

_____ **2.** It is considered a contact force because it acts on objects directly.

✔ **3.** It is a force that causes an object to fall to the ground when dropped.

✔ **4.** It is generally the name for the attraction by Earth on objects at or near its surface.

✔ **5.** It affects the weight of an object.

_____ **6.** It causes objects to slow down as they fall.

✔ **7.** It played a large role in the formation of the solar system.

_____ **8.** It is a very weak force on the surface of Earth.

**Homework:** Imagine that you are standing on a balcony four stories above the ground holding a tennis ball. Using what you have learned in this lesson, write a paragraph that describes what happens to the ball when you drop it off the balcony.

Name _____ Date _____

# What Keeps Planets in Their Orbits?

## Glossary

| | |
|---|---|
| **attraction** | the act or power of attracting |
| **mass** | a measure of the amount of matter in an object |
| **proportional** | corresponding in size or amount |
| **resistance** | a force that tends to oppose or slow motion |
| **sensation** | a feeling or awareness |

**Use the words from the box to complete the following sentences.**

1. Gravitation is a force between objects that have _____**mass**_____.
2. Gravitational force is directly _____**proportional**_____ to the product of the masses of the object.
3. The gravitational _____**attraction**_____ by Earth on or near its surface is usually called gravity.
4. If you are falling, and your surroundings are falling at the same rate, you can experience a _____**sensation**_____ called weightlessness.
5. Air _____**resistance**_____, or drag, slows the acceleration of falling objects.

**Homework:** Use terms you have learned in this lesson to write a paragraph explaining why the planets in the solar system orbit the Sun.

Name _____ Date _____

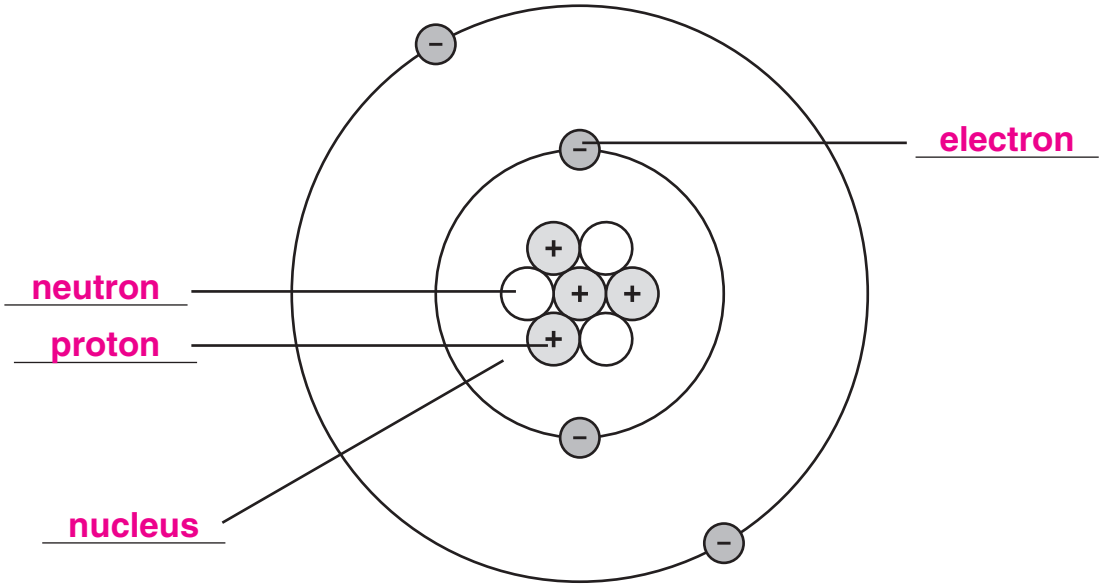


# What Are Atoms and Elements?

**Main Idea** All matter is made up of particles called atoms, the smallest units of elements. As new tools can picture, atoms often form well-ordered patterns, or arrays.

- An atom has at its center a nucleus, which is surrounded by moving electrons.
- An element has only one kind of atom. An element's properties are determined by the way those atoms join together.
- While a few elements are found in pure form, most elements form compounds with other elements.

**A. Complete the diagram by labeling the parts of an atom.**




**B. Complete each sentence to tell about matter.**

1. All matter is made up of **elements**.
2. Elements are made up of **only one kind of atom**.
3. An atom is the **smallest particle** of an element.
4. The nucleus is the structure in **the center of an atom**.
5. The nucleus contains two kinds of particles: **protons and neutrons**.
6. Moving in the space around the nucleus are **electrons**.



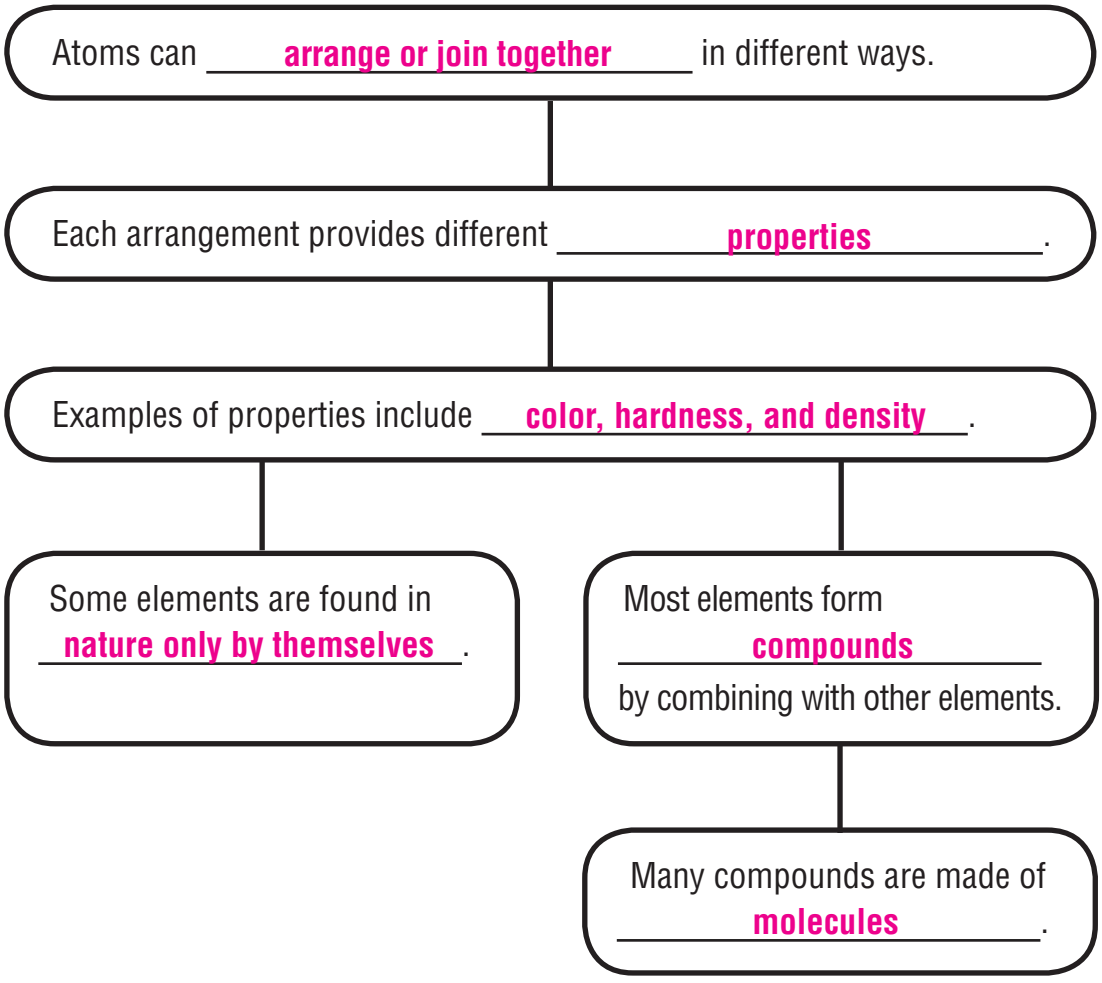

Use with pages 286–293

Name _____ Date _____



# What Are Atoms and Elements?

**C. Complete the diagram about the organization of atoms.**




**D. Put a check next to each description of a scanning tunneling microscope that is true.**

_____ uses lenses and light to magnify images

_____ was invented before the electron microscope

✔ fits on a table top

✔ shows an individual atom

✔ shows how atoms group together in arrays

_____ tells scientists everything about atoms

Name _____ Date _____



# What Are Atoms and Elements?

| | | | |
|---|---|---|---|
| atom | electron | neutron | proton |
| compound | element | nucleus | |

**Write each word from the box next to its definition. Some words will be used more than once.**

| | |
|---|---|
| neutron | a particle that lacks charge |
| compound | a pure substance that is made up of two or more elements that are chemically combined |
| atom | the smallest particle of an element |
| nucleus | the structure in the center of an atom |
| electron | a negatively charged particle |
| element | a substance that cannot be broken apart chemically into other substances |
| proton | a positively charged particle |
| nucleus | contains two types of particles |
| element | made up of only one kind of atom |
| electron | moves in space around the nucleus |
| neutron | has a mass that is about equal to the mass of a proton |

**Vocabulary Skill: Word Origins**

The word *neutron* is based on the Latin word *neuter,* which means "neither." How can this information help you remember the meaning of *neutron*?

Sample response: A neutron has neither a positive nor negative charge.

# What Are Atoms and Elements?

## Glossary

| | |
|---|---|
| **aluminum** | a very lightweight, silver-white metallic element |
| **carbon** | a very common nonmetallic element that occurs in combination with other elements in every living thing |
| **copper** | a tough, reddish–brown metallic element that resists rust |
| **helium** | a very light, colorless, odorless gas that will not burn |
| **silver** | a shiny, white, precious metallic element that conducts heat and electricity better than any other substance |

**Place each word from the box in the correct category in the chart. Then answer the question that follows.**

| Metal | Nonmetal |
|---|---|
| aluminum | carbon |
| copper | helium |
| silver | |

The elements you sorted into different groups have different properties. What is the cause of these different properties?

Sample response: An element's properties result from the atoms that make it up and the way these atoms join together.

**Homework:** Use toothpicks and balls made of molded clay to construct a model of either graphite or diamond (see page 290). Then write a description of the model.

Name _____ Date _____

D.8.2
Main Idea

# What Is the Periodic Table?

**Main Idea** Scientists have identified more than 100 elements, including metals, semimetals, and nonmetals. The elements are organized in the periodic table.

- The first periodic table was created by Dmitri Mendeleyev.
- The properties of an element determine its placement on the periodic table.
- The standardized periodic table has three categories: metals, semimetals, and nonmetals.

**A. Complete the diagram to tell about the history of the periodic table.**

Around **450 B.C.**, the Greek philosopher Empedocles suggested that all matter is made up of four elements—**earth, air, fire, and water**.

↓

In **the 1600s**, English chemist Robert Boyle argued that earth, air, fire, and water **could not be real elements**.

↓

In **the 1700s**, French chemist Antoine-Laurent Lavoisier made one of the first modern **lists of chemical elements**.

↓

In **1869**, Russian chemist Dmitri Mendeleyev developed a way to **arrange and classify the elements**.

↓

The modern periodic table is a table in which the elements are arranged by **their properties**.

Name _____ Date _____



# What Is the Periodic Table?

**B. Rewrite each statement about the periodic table to make it true.**

1. Elements are arranged alphabetically.

   **Elements are arranged in order of increasing atomic number.**

2. An element's atomic number is determined by its temperature.

   **An element's atomic number is determined by the number of protons in its nucleus.**

3. Chemical symbols are the first two letters in an element's name.

   **Chemical symbols are abbreviations, sometimes from Latin or Greek.**

4. Each column is called a period and each row is called a group.

   **Each column is called a group and each row is called a period.**

**C. Use information from the periodic table on pages 300 and 301 to complete the chart below.**

| Symbol | Element | Number of Protons | Metal, Semimetal, or Nonmetal |
|---|---|---|---|
| **Al** | Aluminum | **13** | metal |
| **Hg** | Mercury | **80** | **metal** |
| **Ne** | Neon | **10** | **nonmetal** |
| K | **Potassium** | **19** | **metal** |
| **Si** | Silicon | **14** | **semimetal** |
| **Na** | **Sodium** | 11 | metal |

Name _____ Date _____

D.8.2
Science Vocabulary

# What Is the Periodic Table?

| | | |
|---|---|---|
| chemical symbol | noble gas | periodic table |
| metal | nonmetal | semimetal |

**Use pages 300 and 301 in your book and the words from the box to complete the table.**

**Periodic Table of the Elements**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 2 **He** Helium |
| | | | 5 **B** Boron | 6 **C** Carbon | 7 **N** Nitrogen | 8 **O** Oxygen | 9 **F** Fluorine | 10 **Ne** Neon |
| | | | 13 **Al** Aluminum | 14 **Si** Silicon | | | | 18 **Ar** Argon |
| 28 **Ni** Nickel | 29 **Cu** Copper | 30 **Zn** Zinc | 31 **Ga** Gallium | 32 **Ge** Germanium | | | | 36 **Kr** Krypton |
| 46 **Pd** Palladium | | | | | | | 53 **I** Iodine | 54 **Xe** Xenon |
| 78 **Pt** Platinum | | | | | | 84 **Po** Polonium | | 86 **Rn** Radon |

noble gas

chemical symbol

metal

semimetal

nonmetal

**Vocabulary Skill: Prefixes**

The prefix *non-* means "not" and the prefix *semi-* means "having some of the characteristics of." Use this information to write your own definitions of *nonmetal* and *semimetal.*

**Sample response: A *nonmetal* is not a metal and a *semimetal* is a material that has some characteristics of a metal.**

# What Is the Periodic Table?

## Glossary

| | |
|---|---|
| **brittle** | breaks easily |
| **conduct** | to transmit, to be a channel for |
| **luster** | the ability to reflect light |
| **mixture** | two or more substances combined together |
| **react** | to act chemically |
| **semiconductor** | a mineral substance that conducts electricity better than an insulator but not so well as a metal |

**Use a word from the box to complete each sentence about the properties of elements.**

1. One of the properties most metals have is _____**luster**_____.
2. Copper wires are used to _____**conduct**_____ electricity.
3. Brass is a _____**mixture**_____ of copper and zinc.
4. Under some circumstances silicon conducts electricity and at other times does not, so silicon is a __**semiconductor**__.
5. Solid nonmetals are usually _____**brittle**_____.
6. Oxygen can _____**react**_____ with iron resulting in rust.

**Homework:** Choose an element from the periodic table. Write down everything you know about that element from the information on the periodic table.

Name _____ Date _____



# Where Are Elements Found?

**Main Idea** Most things on Earth are made of only a few elements—far fewer than the more than 100 elements that scientists have discovered.

- Only eight elements make up almost 99 percent of Earth's crust.
- A molecule is a group of two or more atoms that acts as a single unit.
- Carbon compounds are the main parts of all living things.

**A. Complete the outline to tell about rare and common elements.**

**I.** Most elements are quite rare on Earth.

**A.** For example, all of the gold that has ever been mined is not much compared to **the volume of Earth's crust**.

**II.** Other elements are rarer still.

**A.** Many of the elements after **uranium** on the periodic table exist only in **laboratories** and only for **a few fractions of a second**.

**III.** Some elements are very common on Earth.

**A.** Nearly 99 percent of Earth's **crust** is made of only 8 elements: **oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium**.

**B.** Earth's **atmosphere** is made of 2 elements: **oxygen and nitrogen**.

**B. Place a check next to the elements found in living things.**

| | | |
|---|---|---|
| ✔ hydrogen | ✔ nitrogen | ✔ carbon |
| ✔ oxygen | _____ silicon | _____ aluminum |
| _____ iron | ✔ calcium | _____ uranium |

# Where Are Elements Found?

**C. Rewrite each statement about molecules to make it true.**

**1.** Very few compounds are made of molecules.

Many compounds are made of molecules.

**2.** A molecule is a group of two or more compounds that are chemically joined and that act as a single unit.

A molecule is a group of two or more atoms that are chemically joined and that act as a single unit.

**3.** Very few molecules can be made from only a few kinds of atoms.

Many molecules can be made from only a few kinds of atoms.

**D. Complete the chart to tell about carbon compounds.**

| Carbon Compound | Purpose | Examples |
|---|---|---|
| carbohydrates | provide the body with energy | plant tissue, bread, pasta, and cereal |
| proteins | help build muscle and other body tissues | meat, fish, soybeans, eggs, and dairy products |
| lipids | help the body store energy | butter, oils, cheese, and nuts |
| nucleic acids | help living things grow and develop | DNA |

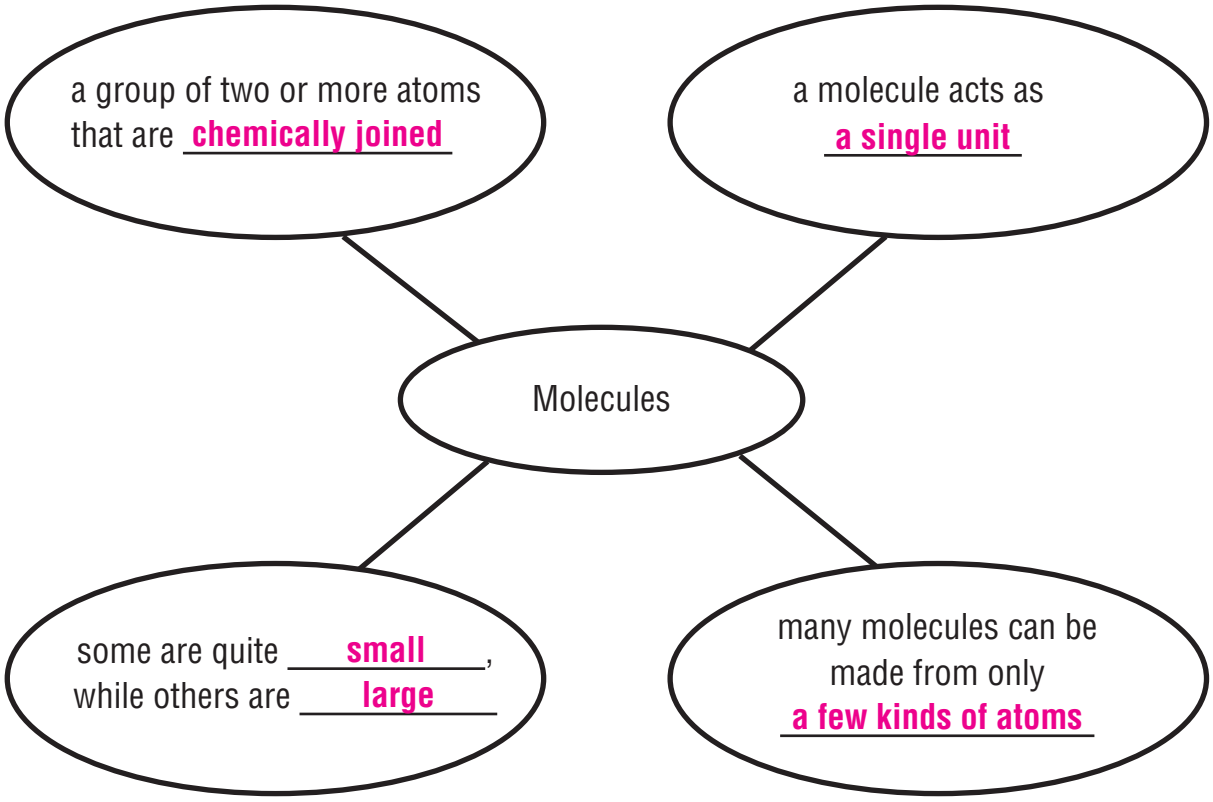
Name _____ Date _____



# Where Are Elements Found?

molecule

**Complete the diagram to tell about molecules.**




**Vocabulary Skill: Synonyms**

Synonyms are words that have similar meanings. For example, *component* and *ingredient* are synonyms for *element*. Think of a synonym for *compound* and use it in a sentence. If you substitute *compound* for the synonym, does it change the meaning of the sentence?

**Sample response: Water is a *combination* of hydrogen and oxygen. Using the word *compound* doesn't really change the meaning of the sentence, but it does make the sentence sound more scientific.**

# Where Are Elements Found?

## Glossary

| | |
|---|---|
| **hydrocarbon** | any compound made of hydrogen and carbon |
| **oxygen** | a colorless, odorless gas that forms about one fifth of the air and about one third of water |
| **plastic** | a hydrocarbon |
| **polymer** | long chains of linked molecules |
| **rare** | seldom seen or found |
| **sucrose** | table sugar |

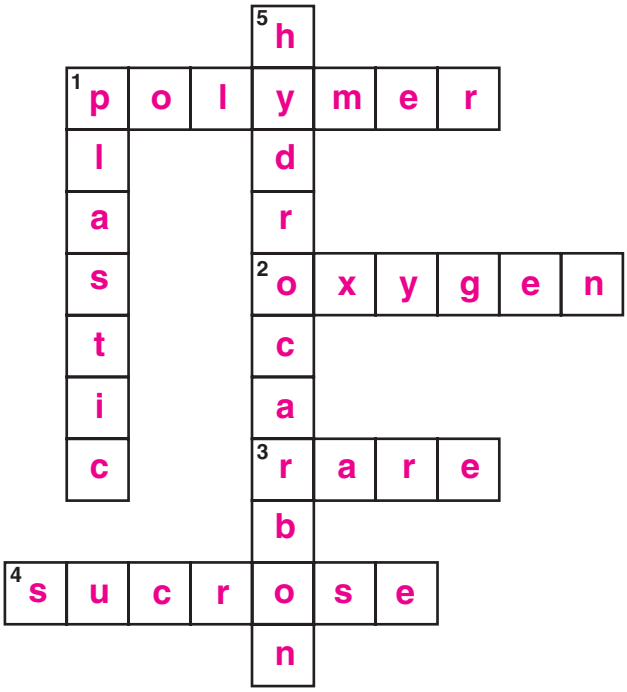
**Use the terms from the box to complete the puzzle about elements.**

### Across

1. DNA is an example of this
2. 46% of Earth's crust
3. describes most of the elements
4. a substance with a sweet taste

### Down

1. an example of a hydrocarbon
5. made of two elements: carbon and hydrogen




**Homework:** Using the analogy of letters and words you read about on page 311 in your textbook, write a paragraph explaining how many molecules can be made from only a few kinds of atoms.

Name _____ Date _____

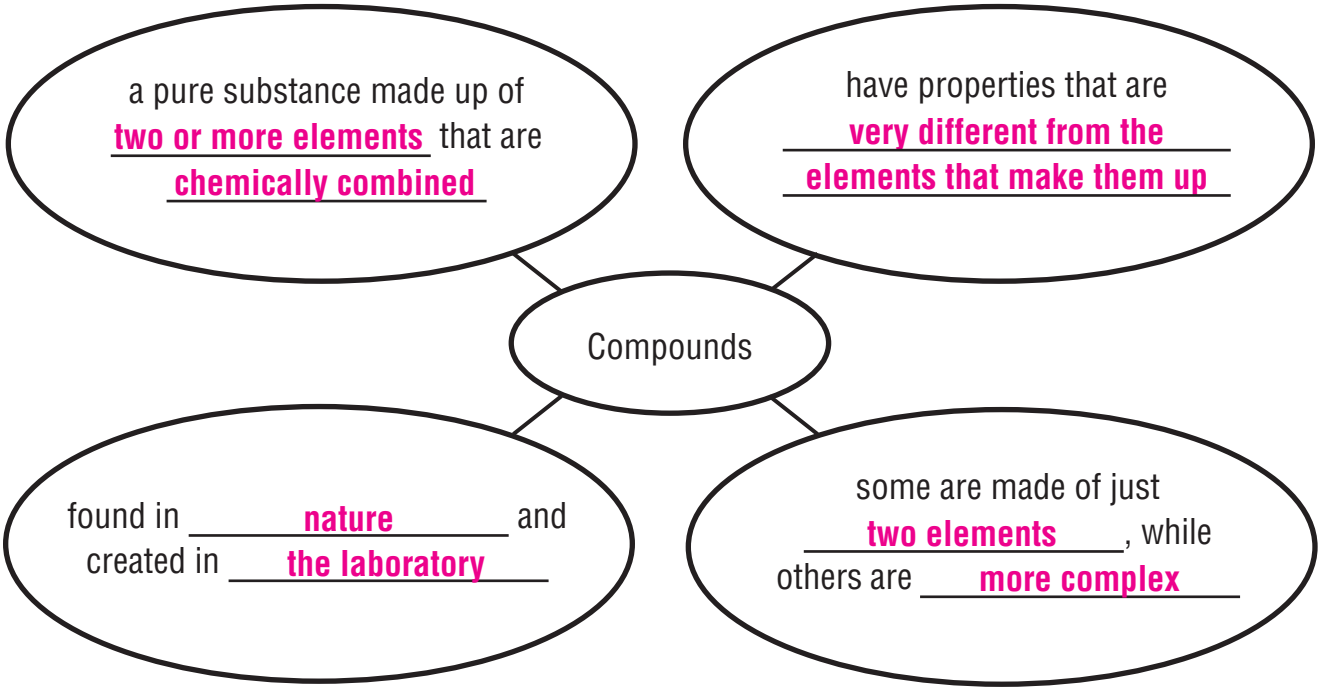


# What Are Compounds?

**Main Idea** Two or more elements can combine to form a compound. Compounds have different properties from the elements that make them up.

- The properties of a compound are different from the elements that make them up.
- Compounds are described using chemical formulas.
- Water is a unique compound that is found everywhere on Earth.

**A. Complete the diagram to tell about compounds. Then answer the question that follows.**




**What is an important factor in all chemical reactions? Explain.**

Sample response: Energy is an important factor in all chemical reactions. Either energy is required to break apart compounds into elements, or it is released when elements combine to form compounds.

Name _____ Date _____



# What Are Compounds?

**B. Complete the sentences to tell about chemical formulas.**

1. $C_{12}H_{22}O_{11}$ is the formula for **sucrose**. It indicates that every molecule of that compound has **12** atoms of carbon, **22** atoms of hydrogen, and **11** of oxygen.
2. **$CaCO_3$** is the formula for calcium carbonate. It indicates that every molecule of that compound has one atom of **calcium**, one atom of **carbon**, and three atoms of **oxygen**.
3. **$Fe_2O_3$** is the formula for iron oxide. It indicates that each **molecule** of that compound has **2** atoms of **iron** and **3** atoms of **oxygen**.

**C. Complete the chart to tell about common compounds.**

| Compound | Examples |
|---|---|
| carbon dioxide | **carbonated drinks** |
| **silicon dioxide** | glass, sand |
| polymers | **fats, proteins, carbohydrates, and plastics** |

**D. Place a check by each statement that is true about water.**

- ✔ Three-fourths of Earth's surface is water.
- _____ Three-fourths of the human body is water.
- ✔ While water is liquid at room temperature, most compounds are not.
- ✔ Water dissolves more substances than any other liquid.
- _____ Water molecules look like a chain of atoms.
- ✔ Water molecules attract each other.

Name _____ Date _____



# What Are Compounds?

chemical formula chemical reaction

**Use the descriptions below to complete each diagram.**

a chemical change

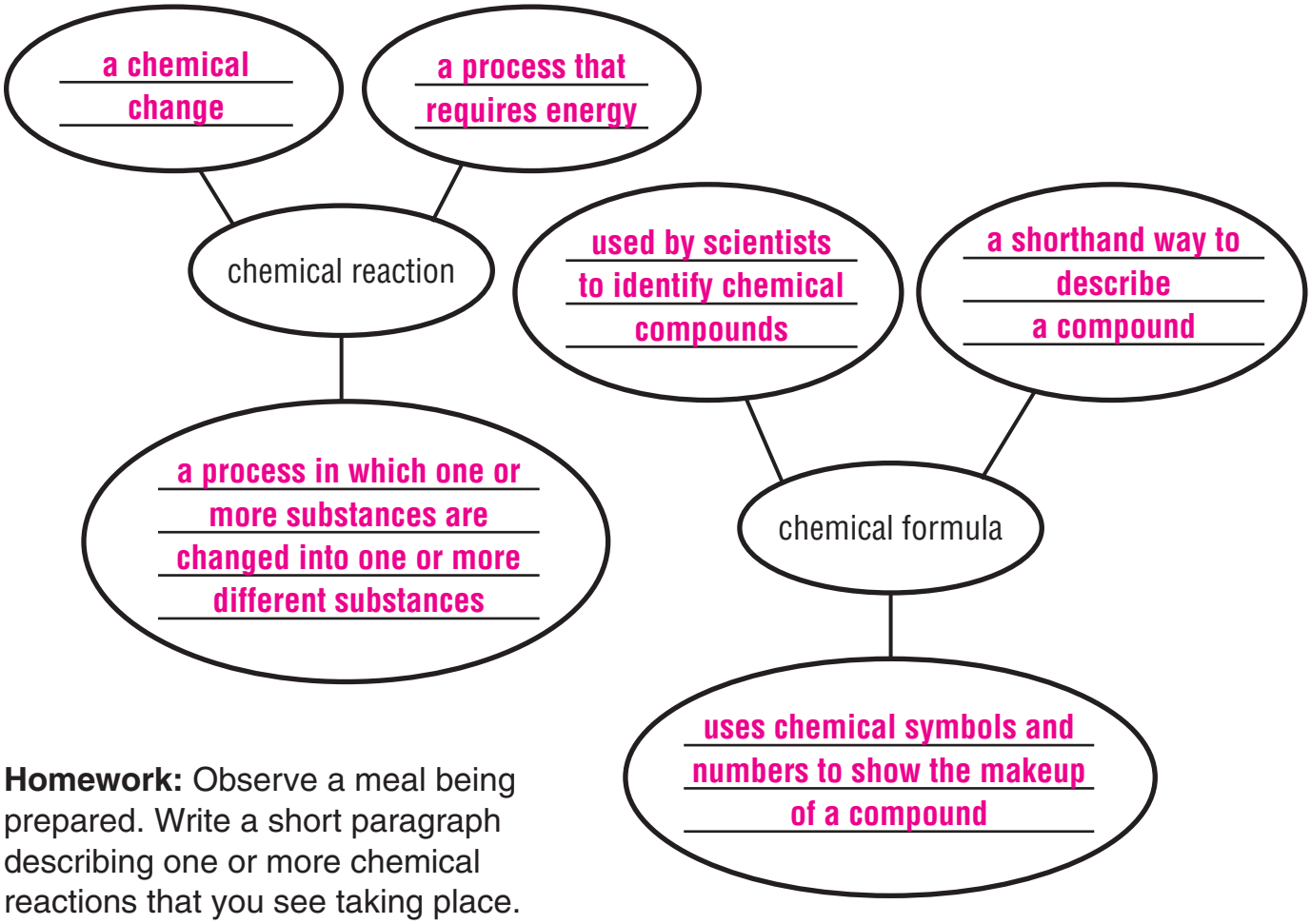
a shorthand way to describe a compound

a process in which one or more substances are changed into one or more different substances

uses chemical symbols and numbers to show the makeup of a compound

a process that requires energy

used by scientists to identify chemical compounds




**Homework:** Observe a meal being prepared. Write a short paragraph describing one or more chemical reactions that you see taking place.

# What Are Compounds?

## Glossary

| | |
|---|---|
| **chemical property** | how a substance reacts with other substances |
| **dissolve** | to change from a solid or gas to a liquid |
| **elements** | things that are made up of only one kind of element |
| **molecular compound** | a compound made of molecules |
| **stable compound** | a compound that does not chemically change very quickly or easily |

**Use words from the word box to complete the following sentences.**

1. Water is a **molecular compound**.
2. Water is made up of two **elements**: hydrogen and oxygen.
3. Water has a unique **chemical property**: It is a liquid at room temperature.
4. Water is not considered a **stable compound**, because it can be chemically changed very quickly.
5. Water has the ability to **dissolve** many compounds.

**Vocabulary Skill: Multiple-Meaning Words**

The word *current* has more than one meaning. What is the meaning of *current* in this sentence?

Scientists proved that water was a compound when they broke it into other substances by passing an electric current through it.

**Sample response: *Current* means the flow of electricity through a wire or other conductor.**

Name _____ Date _____



# What Are Some Properties of Compounds?

**Main Idea** Physical and chemical properties are characteristics used to describe, identify, and classify matter.

- A physical property can be observed without changing the matter. A chemical property is how a substance reacts with other substances.
- Solubility is the measure of how much of one substance can dissolve in another.
- The conductivity of a material is its ability to carry energy.

**A. Classify each property in the box as either a physical property or a chemical property using the chart below.**

| | |
|---|---|
| boiling point | odor |
| color | reactivity |
| conductivity | size |
| density | solubility |
| flexibility | state |
| melting point | |

| Physical Property | Chemical Property |
|---|---|
| boiling point | reactivity |
| color | |
| conductivity | |
| density | |
| flexibility | |
| melting point | |
| odor | |
| size | |
| solubility | |
| state | |

Name _____ Date _____

D.9.2
Main Idea

# What Are Some Properties of Compounds?

**B. Complete the outline to describe physical properties.**

**I.** Mass, volume, and density are physical properties.

**A.** Mass

**1.** Mass is a measure of **the amount of matter in an object or a material**.

**2.** Mass can be measured in **grams or kilograms**.

**B.** Volume

**1.** Volume is **the amount of space matter takes up**.

**2.** Volume can be measured in **cubic centimeters**.

**3.** Liquid volumes are measured in **liters or milliliters**.

**C.** Density

**1.** Density of a material is **its mass per unit volume**.

**II.** Another physical property is state of matter: solid, liquid, or gas.

**A.** The melting point is **the temperature at which a solid substance changes to a liquid**.

**B.** The boiling point is **the temperature at which a liquid changes to a gas**.

**III.** Solubility and conductivity are also physical properties.

**A.** Solubility

**1.** Solubility is the measure of **how much of one substance can dissolve in another**.

**B.** Conductivity

**1.** The conductivity of a material is **its ability to carry energy**.

**2.** Two types of conductivity are **electrical** and **thermal**.

Name _____ Date _____



# What Are Some Properties of Compounds?

| | | | |
|---|---|---|---|
| boiling point | conductivity | melting point | solubility |
| chemical property | density | physical property | |

**Circle the term in parentheses that correctly completes each statement about the properties of matter.**

1. The (boiling point, melting point) of a substance is the temperature at which it changes from a liquid to a gas.
2. The measure of how much of one substance can dissolve in another substance is called (density, solubility).
3. A characteristic that can be measured or detected by the senses is called a (chemical property, physical property).
4. The (density, conductivity) of a material is its ability to carry energy.
5. The temperature at which a solid substance changes to a liquid is called its (melting point, solubility).
6. A (chemical property, physical property) is the ability or tendency of a material to change its chemical makeup.
7. The (density, solubility) of a material is its mass per unit volume, or ratio of mass to volume.

**Vocabulary Skill: Word Parts**

The suffix *-ability* means "able to" and the root *solu-* is derived from the Latin word *solvere,* meaning "loosen." Explain how the word *solubility* is related to the meanings of its parts.

**Sample response: How easily a substance is able to "loosen" is related to how easily it can be dissolved in another substance.**

Name _____ Date _____



# What Are Some Properties of Compounds?

## Glossary

| | |
|---|---|
| **mass** | a measure of the amount of matter in an object |
| **rigid** | have a definite shape and volume |
| **state** | the physical condition of a material |
| **thermal** | of or about heat |
| **volume** | the amount of space a sample of matter takes up |

**Write each word from the box next to the clue it matches.**

mass — measured in grams or kilograms

state — solid

volume — measured in cubic centimeters for solids

state — liquid

rigid — not changing

state — gas

thermal — warmed

**Homework:** Look around your home. Make a list of the ways plastic and rubber are used as electrical and thermal insulators. You may want to do some research on insulators in order to lengthen your list.

Name _____ Date _____



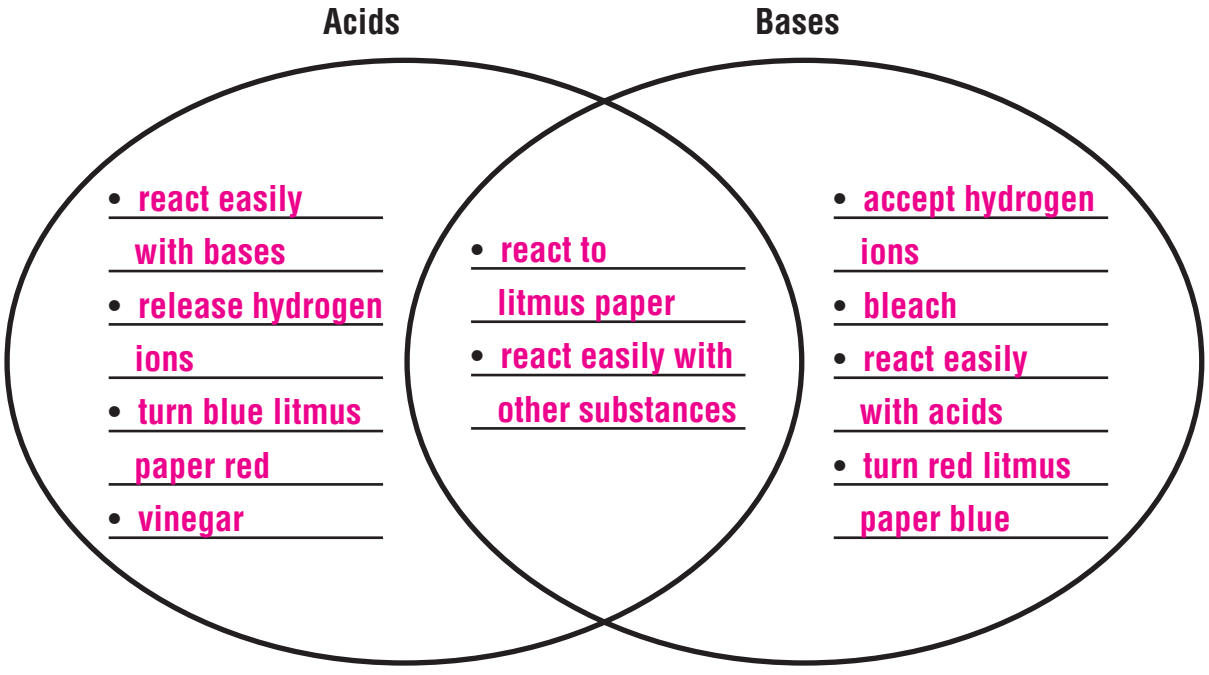
# What Are Acids, Bases, and Salts?

**Main Idea** Acids, bases, and salts are classes of compounds, each with characteristic properties. The strengths of acids and bases are measured with the pH scale.

- Acids release hydrogen ions and react easily with bases.
- Bases accept hydrogen ions and react easily with acids.
- Salts are formed when a strong acid reacts with a strong base.

**A. Use the items below to complete the diagram to compare and contrast acids and bases.**

| | |
|---|---|
| accept hydrogen ions | react easily with acids |
| bleach | release hydrogen ions |
| react to litmus paper | turn blue litmus paper red |
| react easily with other substances | turn red litmus paper blue |
| react easily with bases | vinegar |



# What Are Acids, Bases, and Salts?

**B. Rewrite each statement about acids and bases to make it true.**

1. An acid typically receives hydrogen ions and a base typically releases hydrogen ions.

   **An acid typically releases hydrogen ions and a base typically receives hydrogen ions.**

2. Acids and bases can be identified by mixing them with water.

   **Acids and bases can be identified by using an acid-base indicator.**

3. Water is an example of an acid.

   **Water is an example of a neutral substance.**

4. A value called pH stands for parts of helium.

   **A value called pH stands for potential of hydrogen.**

5. Acids and bases have pH values of zero.

   **Acids have pH values less than 7. Bases have pH values greater than 7.**

**C. Put a check next to each true statement about salts.**

- ✔ typically made from a metal and a nonmetal
- ✔ have high melting points
- _____ most dissolve slowly in water
- ✔ found in abundance in the ocean
- _____ raise the melting point of water
- ✔ needed by the human body

Name _____ Date _____



# What Are Acids, Bases, and Salts?

| | | |
|---|---|---|
| acid | base | indicator |
| pH | salt | |

**Write each characteristic below in the appropriate column in the chart. Then answer the question that follows.**

| | |
|---|---|
| detergents | potassium |
| fruit juices | sodium chloride |
| pH values greater than 7 | used to digest food |
| pH values less than 7 | |

| Acids | Bases | Salts |
|---|---|---|
| fruit juices | detergents | potassium |
| pH values less than 7 | pH values greater than 7 | sodium chloride |
| used to digest food | | |

What is the purpose of an indicator?

Sample response: An indicator is used to identify acids and bases. It is a substance or material that changes color in the presence of an acid or a base.

**Vocabulary Skill: Word Derivations**

What is the origin of the word *acid?* Use a dictionary to help you.

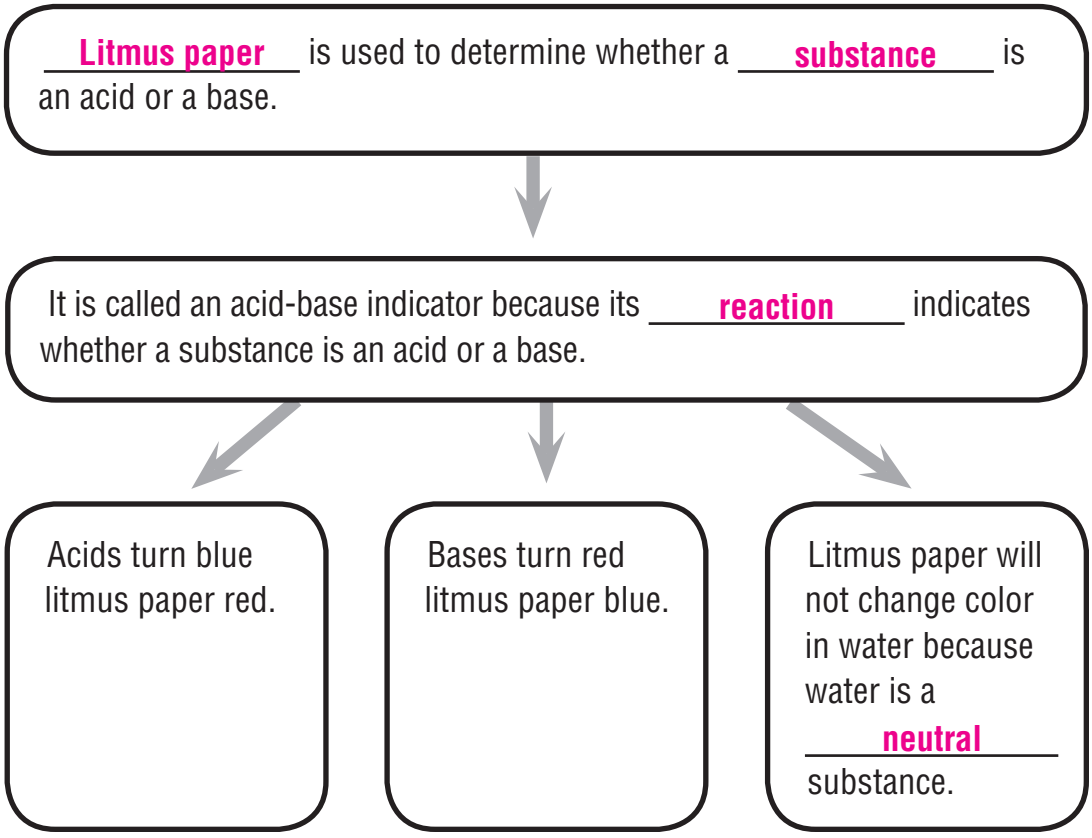
Sample response: *Acid* comes from the Latin word *acere,* meaning "to be sour."

# What Are Acids, Bases, and Salts?

## Glossary

| | |
|---|---|
| **litmus paper** | paper treated with litmus, a dye that changes color in the presence of acids or bases |
| **neutral** | neither one thing or the other |
| **reaction** | action in response to some influence or force |
| **substance** | a material of a particular kind or composition |

**Use the words from the box to complete the diagram.**




**Homework:** Draw a pH scale. Color the portion of the scale that would include acids red and label it. Color the portion of the scale that would include bases blue and label it. Indicate where on the scale the substance water would fit. Estimate the placement of specific acids and bases on the scale based on the descriptions of "weak" and "strong" found in this chapter.

Name _____ Date _____



# What Are the Three States of Matter?

**Main Idea** Matter can exist in three familiar states: solids, liquids, and gases. These states are determined by the motion and arrangement of particles.

- The properties of a substance's particles determine its state.
- Solids have a definite shape and volume and their particles are arranged very close together.
- Liquids have a definite volume, but no definite shape. Their particles are close together and can move about.
- Gases do not have a definite shape or volume. Their particles are spread far apart and are constantly moving.

**A. Use the descriptions from the box to complete the chart to tell about the states of matter.**

completely random
can slip past each other
closely packed
vibrate, but don't move about
always changing
spread very far apart

| | Solid | Liquid | Gas |
|---|---|---|---|
| **Particle Arrangement** | closely packed | close together, but have space | spread very far apart |
| **Particle Movement** | vibrate, but don't move about | can slip past one another | constantly bouncing off one another |




Use with pages 358–365

Name _____ Date _____



# What Are the Three States of Matter?

**B. Write the name of the state of matter that matches the description.**

| | |
|---|---|
| solid | matter that has a definite volume and a definite shape |
| liquid | matter that has a definite volume, but no definite shape |
| gas | matter that does not have a definite shape or volume |

**C. Arrange the three states of matter—*solid, liquid,* and *gas*—from least compressible to most compressible.**

Least Compressible → Most Compressible

solid, liquid, gas

**D. Write the terms *helium, oil,* and *wood* in the diagram. Then complete the sentence that follows to explain your reasoning.**

Least Compressible → Most Compressible

wood, oil, helium

The most compressible state of matter is gas because its particles can move freely about.

Name _____ Date _____



# What Are the Three States of Matter?

gas liquid solid

**Place a check in the appropriate column to tell about the properties of each state of matter.**

| Matter | Definite Shape | No Definite Shape | Definite Volume | No Definite Volume |
|---|---|---|---|---|
| Solid | ✔ | | ✔ | |
| Liquid | | ✔ | ✔ | |
| Gas | | ✔ | | ✔ |

**Vocabulary Skill: Word Origins**

*Gas* is a coined, or invented, word. Use a dictionary to identify the origin of this word.

**Sample response: About 400 years ago, a scientist needed a word to describe water vapor. Because he knew that water vapor was so changeable, he thought of the word *chaos,* which means "complete confusion or complete disorder." He used the sound of the word *chaos* to coin or invent a new word, *gas.***

Name _____ Date _____



# What Are the Three States of Matter?

## Glossary

| | |
|---|---|
| **attraction** | act or power of gathering |
| **fluid** | any substance whose particles can flow freely |
| **state** | physical form |
| **tension** | a stretched condition |

**Use the words from the box to complete the sentences about the states of matter.**

1. A solid is one _____**state**_____ of matter.
2. Water is a _____**fluid**_____, and flows easily at room temperature.
3. Surface _____**tension**_____, a force of attraction among the particles at the surface of a liquid, is a property of liquids.
4. In a solid, the small forces of _____**attraction**_____ between particles keeps them from moving from place to place.

**Homework:** Complete a chart like the one shown with examples of each of the states of matter.

**States of Matter**

| Solid | Liquid | Gas |
|---|---|---|
| | | |
| | | |
| | | |

Name _____ Date _____

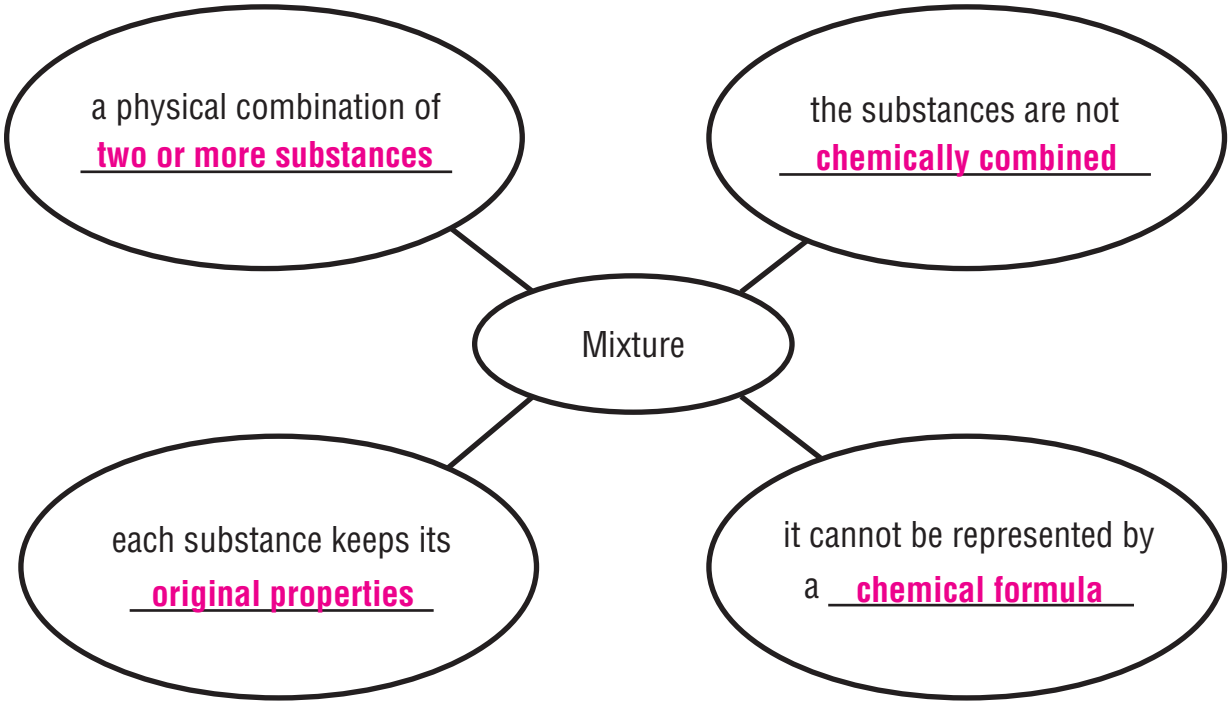


# What Are Mixtures and Solutions?

**Main Idea** In a mixture, the parts keep their physical properties. These properties can be used to separate the mixture. Mixtures that are evenly mixed at the atomic or molecular level are called solutions.

- Mixtures are physical combinations of two or more substances in which the substances are not chemically combined.
- Solutions are mixtures in which the particles are evenly mixed at the atomic or molecular level.
- Solutions can be separated by making use of the different properties of the mixed materials.
- Alloys are solutions of two or more metals or of a metal and another solid.

**A. Fill in the blanks to complete the description of a mixture.**



Name _____ Date _____



# What Are Mixtures and Solutions?

**B. Rewrite each statement about mixtures to make it true.**

1. In a heterogeneous mixture, two or more substances are evenly mixed.

   In a homogeneous mixture, two or more substances are evenly mixed.

2. In a homogeneous mixture, two or more substances are distributed unevenly.

   In a heterogeneous mixture, two or more substances are distributed unevenly.

3. In a solution, particles do not mix at the atomic or molecular level.

   In a solution, particles mix at the atomic or molecular level.

4. The methods of separating a solution include filtering and condensation.

   The methods of separating a solution include evaporation, and boiling.

**C. Complete the chart to tell about alloys and their uses.**

| Alloy | A Mixture of | Used for |
|---|---|---|
| bronze | copper, tin | tools, weapons, sculptures |
| steel | iron, carbon, and other solids | nails, chains, tools, support beams |
| brass | copper, zinc | musical instruments |
| sterling silver | silver, copper | jewelry |

Name _____ Date _____



# What Are Mixtures and Solutions?

mixture solution

**A. Use the words from the box to complete each sentence to tell about mixtures and solutions.**

1. A **solution** is a homogeneous mixture of two or more substances that are evenly distributed.
2. A **mixture** is a physical combination of two or more substances.

**B. Classify each of the following items as a mixture or a solution.**

air
birdseed
pink lemonade
salad
salt water
sand and pebbles
soda water
vegetable soup

| Mixture | Solution |
|---|---|
| birdseed | air |
| salad | pink lemonade |
| sand and pebbles | salt water |
| vegetable soup | soda water |

**Vocabulary Skill: Root Words**

*Genus* is a Latin word meaning "type" or "kind." The prefix *hetero-* means "different" and the prefix *homo-* means "the same." Using this information, write a definition for each word.

**Sample response: *Heterogeneous* means "made up of different kinds of things", while *homogeneous* means "made up of the same things."**




Use with pages 368–375

Name _____ Date _____



# What Are Mixtures and Solutions?

## Glossary

| | |
|---|---|
| **solute** | a substance being dissolved |
| **solvent** | a substance that dissolves the solute |

**Identify the solution, the solute, and the solvent to complete the following descriptions.**

**1.** Sugar cane juice is made up of water and sugar.

**A.** The solution is _____**sugar cane juice**_____.

**B.** The solvent is _____**water**_____.

**C.** The solute is _____**sugar**_____.

**2.** Salt water is made up of salt and water.

**A.** Salt water is the _____**solution**_____.

**B.** Water is the _____**solvent**_____.

**C.** Salt is the _____**solute**_____.

**3.** Acid rain is made up of water and acids or other chemicals.

**A.** The solution is _____**acid rain**_____.

**B.** The solvent is _____**water**_____.

**C.** The solute is _____**acids or other chemicals**_____.

**Homework:** Write a paragraph describing how you can separate a solution of salt water.

Name _____ Date _____

D.10.3
Main Idea

# How Does Matter Change?

**Main Idea** A chemical change involves a change in the identity of matter, whereas a physical change does not.

- Most solids will expand when heated and contract when cooled.
- A solid changes to a liquid when heated to its melting point, and a liquid changes to a solid when cooled to its freezing point.
- Vaporization, condensation, sublimation, and deposition are all physical changes.

**A. Complete each sentence to tell about changes in matter.**

1. A change of size, shape, or state of matter is a(n) ___physical change___.
2. The increase in the size of a substance due to a change in temperature is called ___thermal expansion___.
3. When a solid undergoes ___thermal contraction___, it takes up less space due to cooling.
4. Although heating or cooling may change the volume of matter, the ___mass___ will stay the same.
5. Vaporization is the change of state from a ___liquid___ to a ___gas___.
6. Slow or gradual vaporization is called ___evaporation___.
7. ___Condensation___ is a change of state from a gas to a liquid.
8. The process of changing directly from a solid to a gas is called ___sublimation___.
9. The opposite of sublimation is ___deposition___.

Name _____ Date _____



# How Does Matter Change?

**B. Rewrite each statement about physical changes to make it true.**

**1.** A solid begins to change to a liquid at its freezing point.

**A solid begins to change to a liquid at its melting point.**

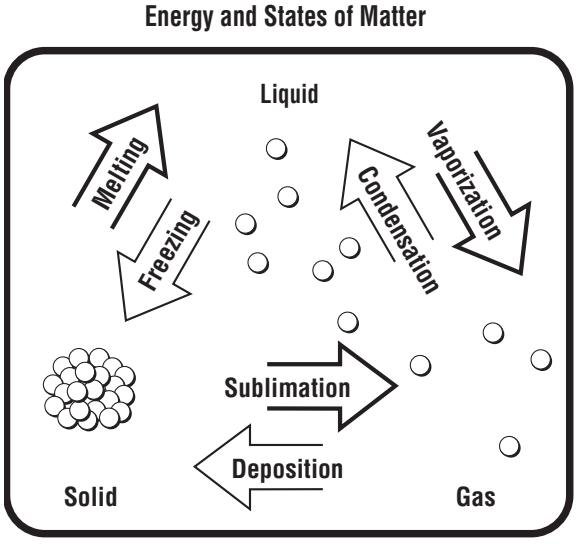
**2.** When energy is removed from a liquid, the liquid will begin to melt.

**When energy is removed from a liquid, the liquid will begin to freeze.**

**3.** The melting point and freezing point for any substance is 0°C.

**The melting point and freezing point for any substance are the same temperature.**

**C. Use the diagram below to answer the following questions about the changes in matter.**




**1.** What happens when energy is removed from a liquid?

**A solid forms when energy is removed from a liquid.**

**2.** What happens in vaporization?

**Gas forms when energy is added to a liquid.**

**3.** What happens in sublimation?

**Gas forms when energy is added to a solid.**

**4.** What happens in deposition?

**A solid forms when energy is removed from a gas.**

Name _____ Date _____



# How Does Matter Change?

| | |
|---|---|
| condensation | evaporation |
| sublimation | vaporization |

**A. Use the words from the box to complete each sentence about physical changes to matter.**

1. ___Vaporization___ is the change of state from a liquid to a gas.
2. ___Condensation___ is the change of state from a gas to a liquid.
3. Slow or gradual vaporization is called ___evaporation___.
4. The process of changing from a solid to a gas is called ___sublimation___.

**B. Write each word from the box next to the statement that describes it.**

___condensation___ water droplets forming on the outside of a glass of ice water

___vaporization___ water being heated in a tea kettle

___sublimation___ a solid changes directly into a gas

___evaporation___ there is less water in a fish tank after a week

**Vocabulary Skill: Antonyms**

Antonyms are words with opposite meanings. Find a pair of antonyms in the lesson.

Sample responses: expansion/contraction, deposition/sublimation, vaporization/condensation

Name _____ Date _____



# How Does Matter Change?

## Glossary

| | |
|---|---|
| **contraction** | the act or process of making smaller |
| **expansion** | the act or process of making larger |
| **thermal** | of or relating to heat |
| **vibrate** | to move back and forth rapidly |

**Use the words from the box to complete the diagram to tell about physical changes. Then answer the question that follows.**

The temperature of a solid rises.

↓

Particles in the solid ___vibrate___ more rapidly.

↓

The solid undergoes ___thermal___ ___expansion___.

A solid is cooled.

↓

The particles ___vibrate___ more slowly.

↓

The solid undergoes ___thermal___ ___contraction___.

**Why do engineers add expansion joints to bridges in order to make them safer?**

**Sample response: Thermal expansion and contraction can put a strain on bridges. Scientists use expansion joints, space between the metal parts, that allows the bridge to change length.**

**Homework:** Write a short paragraph explaining why ice floats. Try to use as many words from the box in your answer as you can.

Name _____ Date _____



# What Happens in a Chemical Reaction?

**Main Idea** A chemical change involves making and breaking chemical bonds to form new substances. Chemical changes can either absorb or release energy.

- A chemical change results in one or more new substances.
- Matter is neither created nor destroyed in chemical and physical changes.
- Energy is always involved in a chemical reaction.

**A. Circle the items that are examples of chemical changes.**

bananas ripening

dry ice sublimating into carbon dioxide gas

burning natural gas on a stove

frost forming on grass

lichens growing on rocks

liquid water freezing into ice

burning wood in a campfire

rust forming on a bicycle chain

**B. Put a check next to the items that are signs of a chemical change.**

✔ change in color

✔ the release of heat

_____ decrease of matter

✔ growth of living organism

_____ increase of matter

✔ release of light

Name _____ Date _____

D.10.4
Main Idea

# What Happens in a Chemical Reaction?

**C. Rewrite each statement about chemical reactions to make it true.**

1. A chemical change is a change in matter that results in a change in color.

   **A chemical change is a change in matter that results in new substances being formed.**

2. In any sample of matter, forces called reactants hold the atoms or molecules together.

   **In any sample of matter, forces called chemical bonds hold the atoms or molecules together.**

3. Scientists use ratios to describe the reactants and products of a chemical reaction.

   **Scientists use chemical equations to describe the reactants and products of a chemical reaction.**

**D. Circle the choice that best completes each sentence about the conservation of matter.**

1. In a physical change, the amount of matter (increases, stays the same, decreases).
2. In a chemical change, the amount of matter (increases, stays the same, decreases).
3. Regardless of the kind of change, matter is (created, conserved, destroyed).
4. The mass of materials before a chemical change is (less than, equal to, more than) the mass afterwards.
5. In a chemical reaction, the total mass of the reactants is (less than, equal to, greater than) the total mass of the products.

Name _____ Date _____



# What Happens in a Chemical Reaction?

product reactant

**A. Use the words from the box to complete each sentence to tell about products and reactants.**

1. When a substance enters into and is altered through the course of a chemical change, it is called a ___reactant___.
2. A substance that results from a chemical change is called a ___product___.

**B. Label the reactants and products in the following chemical equations.**

iron + oxygen → rust

___reactants___ ___product___

$2H_2O \rightarrow 2H_2 + O_2$

___reactant___ ___products___

**C. Using chemical formulas, write a chemical equation for the following chemical reaction. Six molecules of water and six molecules of carbon dioxide are the reactants. One molecule of sugar and six molecules of oxygen are the products.**

$6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$

**Homework:** Choose one of the locations listed below. Then write a paragraph describing at least three chemical reactions that could occur at that location.

- a kitchen
- a campsite
- a science laboratory

Name _____ Date _____



# What Happens in a Chemical Reaction?

## Glossary

| | |
|---|---|
| **breaking** | coming apart |
| **created** | brought into being; made |
| **decays** | rots |
| **destroyed** | done away with |
| **forming** | taking shape |
| **ripens** | matures; develops |

**Use the words in the box to complete the sentences about chemical changes.**

1. In any sample of matter, forces called chemical bonds hold the atoms or molecules together. Chemical changes involve ___breaking___ existing bonds and ___forming___ new ones.
2. Fruit changes chemically when it either ___ripens___ or ___decays___. You can use a scale to prove mass is conserved when matter changes.
3. When matter changes, mass is neither ___created___ nor ___destroyed___.

**Vocabulary Skill: Antonyms**

Antonyms are words with opposite meanings. Write the three pairs of antonyms from the box above.

created/destroyed

ripens/decays

breaking/forming