

# Reading and Writing in Science



# Contents

## Life Science

<b>Chapter 1</b>	<b>Structure of Living Things . . . . .</b>	<b>1</b>
<b>Chapter 2</b>	<b>Plant Structures and Functions . . . . .</b>	<b>21</b>
<b>Chapter 3</b>	<b>Human Body Systems . . . . .</b>	<b>41</b>

## Earth Science

<b>Chapter 4</b>	<b>Earth's Water . . . . .</b>	<b>71</b>
<b>Chapter 5</b>	<b>Earth's Weather . . . . .</b>	<b>95</b>
<b>Chapter 6</b>	<b>The Solar System . . . . .</b>	<b>123</b>

## Physical Science

<b>Chapter 7</b>	<b>Types of Matter . . . . .</b>	<b>143</b>
<b>Chapter 8</b>	<b>Changes in Matter . . . . .</b>	<b>171</b>

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## LIFE SCIENCE

### CHAPTER 1

#### Structure of Living Things

<b>Chapter Concept Map</b> .....	1
<b>Chapter Literature</b> .....	2
<b>Lesson 1</b>	
Lesson Outline .....	3
Lesson Vocabulary .....	5
Cloze Test .....	6
<b>Lesson 2</b>	
Lesson Outline .....	7
Lesson Vocabulary .....	9
Cloze Test .....	10
<b>Lesson 3</b>	
Lesson Outline .....	11
Lesson Vocabulary .....	13
Cloze Test .....	14
<b>Chapter 1 Vocabulary</b> .....	19

### CHAPTER 2

#### Plant Structures and Functions

<b>Chapter Concept Map</b> .....	21
<b>Chapter Literature</b> .....	22
<b>Lesson 1</b>	
Lesson Outline .....	23
Lesson Vocabulary .....	25
Cloze Test .....	26
<b>Lesson 2</b>	
Lesson Outline .....	27
Lesson Vocabulary .....	29
Cloze Test .....	30
<b>Lesson 3</b>	
Lesson Outline .....	31
Lesson Vocabulary .....	33
Cloze Test .....	34
<b>Chapter 2 Vocabulary</b> .....	39

# Contents

## CHAPTER 3

### Human Body Systems

<b>Chapter Concept Map</b> .....	<b>41</b>
<b>Chapter Literature</b> .....	<b>42</b>
<b>Lesson 1</b>	
Lesson Outline .....	43
Lesson Vocabulary .....	45
Cloze Test .....	46
<b>Lesson 2</b>	
Lesson Outline .....	47
Lesson Vocabulary .....	49
Cloze Test .....	50
<b>Lesson 3</b>	
Lesson Outline .....	53
Lesson Vocabulary .....	55
Cloze Test .....	56
<b>Lesson 4</b>	
Lesson Outline .....	57
Lesson Vocabulary .....	59
Cloze Test .....	60
<b>Lesson 5</b>	
Lesson Outline .....	63
Lesson Vocabulary .....	65
Cloze Test .....	66
<b>Chapter 3 Vocabulary</b> .....	<b>69</b>

## EARTH SCIENCE

### CHAPTER 4

#### Earth's Water

<b>Chapter Concept Map</b> . . . . .	71
<b>Chapter Literature</b> . . . . .	72
<b>Lesson 1</b>	
Lesson Outline . . . . .	73
Lesson Vocabulary . . . . .	75
Cloze Test . . . . .	76
<b>Lesson 2</b>	
Lesson Outline . . . . .	77
Lesson Vocabulary . . . . .	79
Cloze Test . . . . .	80
<b>Lesson 3</b>	
Lesson Outline . . . . .	81
Lesson Vocabulary . . . . .	83
Cloze Test . . . . .	84
<b>Lesson 4</b>	
Lesson Outline . . . . .	87
Lesson Vocabulary . . . . .	89
Cloze Test . . . . .	90
<b>Chapter 4 Vocabulary</b> . . . . .	93

### CHAPTER 5

#### Earth's Weather

<b>Chapter Concept Map</b> . . . . .	95
<b>Chapter Literature</b> . . . . .	96
<b>Lesson 1</b>	
Lesson Outline . . . . .	97
Lesson Vocabulary . . . . .	99
Cloze Test . . . . .	100
<b>Lesson 2</b>	
Lesson Outline . . . . .	101
Lesson Vocabulary . . . . .	103
Cloze Test . . . . .	104

# Contents

<b>Lesson 3</b>	Lesson Outline . . . . .	105
	Lesson Vocabulary . . . . .	107
	Cloze Test . . . . .	108
<b>Lesson 4</b>	Lesson Outline . . . . .	109
	Lesson Vocabulary . . . . .	111
	Cloze Test . . . . .	112
<b>Lesson 5</b>	Lesson Outline . . . . .	115
	Lesson Vocabulary . . . . .	117
	Cloze Test . . . . .	118
	<b>Chapter 5 Vocabulary . . . . .</b>	<b>121</b>

## **CHAPTER 6**

---

### **The Solar System**

	<b>Chapter Concept Map . . . . .</b>	<b>123</b>
	<b>Chapter Literature . . . . .</b>	<b>124</b>
<b>Lesson 1</b>	Lesson Outline . . . . .	125
	Lesson Vocabulary . . . . .	127
	Cloze Test . . . . .	128
<b>Lesson 2</b>	Lesson Outline . . . . .	129
	Lesson Vocabulary . . . . .	131
	Cloze Test . . . . .	132
<b>Lesson 3</b>	Lesson Outline . . . . .	133
	Lesson Vocabulary . . . . .	135
	Cloze Test . . . . .	136
	<b>Chapter 6 Vocabulary . . . . .</b>	<b>141</b>

## PHYSICAL SCIENCE

### CHAPTER 7

#### Types of Matter

<b>Chapter Concept Map</b> . . . . .	143
<b>Chapter Literature</b> . . . . .	144
<b>Lesson 1</b>	
Lesson Outline . . . . .	145
Lesson Vocabulary . . . . .	147
Cloze Test . . . . .	148
<b>Lesson 2</b>	
Lesson Outline . . . . .	149
Lesson Vocabulary . . . . .	151
Cloze Test . . . . .	152
<b>Lesson 3</b>	
Lesson Outline . . . . .	153
Lesson Vocabulary . . . . .	155
Cloze Test . . . . .	156
<b>Lesson 4</b>	
Lesson Outline . . . . .	159
Lesson Vocabulary . . . . .	161
Cloze Test . . . . .	162
<b>Lesson 5</b>	
Lesson Outline . . . . .	165
Lesson Vocabulary . . . . .	167
Cloze Test . . . . .	168
<b>Chapter 7 Vocabulary</b> . . . . .	169

# Contents

<b>CHAPTER 8</b>	
<b>Changes in Matter</b>	
<b>Chapter Concept Map</b>	171
<b>Chapter Literature</b>	172
<b>Lesson 1</b>	
Lesson Outline	173
Lesson Vocabulary	175
Cloze Test	176
<b>Lesson 2</b>	
Lesson Outline	177
Lesson Vocabulary	179
Cloze Test	180
<b>Lesson 3</b>	
Lesson Outline	181
Lesson Vocabulary	183
Cloze Test	184
<b>Chapter 8 Vocabulary</b>	189



# Structure of Living Things

Complete the concept map with the information you learned about the structure of living things.

<b>Unicellular</b>		<b>Multicellular</b>	
<b>Bacteria</b>		<b>Protists</b>	
ancient	animal-like	vascular	vertebrates
true	plant-like	nonvascular	invertebrates
	<b>Fungi-like</b>	<b>Fungus</b>	

## Cancer-Sniffing Canines

Read the Literature feature in your textbook.



### Write About It

**Response to Literature** In this article, you learned that dogs are being used to detect cancer. Write a letter to the editor of your local newspaper. State your position about using dogs for research. Include convincing evidence that backs up your position.

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# Cells

Use your textbook to help you fill in the blanks.

## What are plants and animals made of?

1. Plants, animals, and all living things are made of \_\_\_\_\_ .
2. A cell is the \_\_\_\_\_ of a living thing that can carry out the basic processes of life.
3. The cells of \_\_\_\_\_ are not the same as animal cells.
4. Plants need something in their cells to provide \_\_\_\_\_ .
5. Plant leaf cells produce \_\_\_\_\_ for the plant.
6. Animals have to eat other living things to get \_\_\_\_\_ .

## What are the organelles in animal cells?

7. The \_\_\_\_\_ is a layer around the outside of the cell.
8. Cytoplasm supports all of the \_\_\_\_\_ inside the cell.
9. The \_\_\_\_\_ controls all of the activity in the cell.
10. Mitochondria turn food into \_\_\_\_\_ for the cell to use.
11. The \_\_\_\_\_ store water, food, and wastes.

**What are the organelles in plant cells?**

- 12.** The \_\_\_\_\_ is an additional layer around the outside of plant cells.
- 13.** The large central vacuoles of plant cells provide support by \_\_\_\_\_ .
- 14.** Organelles in plant cells that turn energy from sunlight into food are called \_\_\_\_\_ .
- 15.** A green chemical called \_\_\_\_\_ makes chloroplasts green.

**How can cells be seen?**

- 16.** A(n) \_\_\_\_\_ must be used to see cells.

**Summarize the Main Idea**

- 17.** What are both plants and animals made of?

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# Cells

- |                         |                        |                        |
|-------------------------|------------------------|------------------------|
| <b>a.</b> cell          | <b>d.</b> nucleus      | <b>g.</b> cell wall    |
| <b>b.</b> cell membrane | <b>e.</b> mitochondria | <b>h.</b> chloroplasts |
| <b>c.</b> cytoplasm     | <b>f.</b> vacuoles     | <b>i.</b> microscope   |

## Fill in the blank.

1. \_\_\_\_\_ A(n) organelle that controls all of the activity of the cell.
2. \_\_\_\_\_ Organelles that store water, food, and wastes.
3. \_\_\_\_\_ An instrument that magnifies objects.
4. \_\_\_\_\_ The smallest unit of a living thing that can carry out the basic processes of life.
5. \_\_\_\_\_ An additional layer around plant cells that provides extra support.
6. \_\_\_\_\_ Organelles that break down food and turn it into energy for the cell to use.
7. \_\_\_\_\_ A layer around the outside of the cell.
8. \_\_\_\_\_ Green organelles in plant cells that turn energy from sunlight into food.
9. \_\_\_\_\_ A gel-like substance that supports all of the organelles inside the cell membrane.

# Cells

cells	chlorophyll	microscope	sunlight
cell membrane	chloroplasts	mitochondria	vacuoles
cell wall	cytoplasm	nucleus	

## Fill in the blanks.

Plants and animals are living things. All plants and animals are made of \_\_\_\_\_ . The \_\_\_\_\_ is a layer around the outside of all cells. Plant cells have an additional layer called the \_\_\_\_\_ that provides extra support. \_\_\_\_\_ is a gel-like substance inside the cell membrane. All activity in the cell is controlled by the \_\_\_\_\_ . \_\_\_\_\_ break down food and turn it into energy for the cell to use. Water, food, and wastes are stored in the \_\_\_\_\_ of the cell. A green chemical called \_\_\_\_\_ is in the \_\_\_\_\_ of plant cells. Plant cells turn energy from \_\_\_\_\_ into food. People didn't know that cells existed until they could see them under a \_\_\_\_\_ .

# From Cells to Organisms

Use your textbook to help you fill in the blanks.

## How are living things organized?

1. An individual living thing is called a(n) \_\_\_\_\_ .
2. \_\_\_\_\_ organisms have only one cell.
3. \_\_\_\_\_ organisms have many different kinds of cells.
4. In multicellular organisms, the cells \_\_\_\_\_ to take care of different functions of the organism.

## How do cells work together?

5. A group of similar cells called a(n) \_\_\_\_\_ work together to do the same job in an organism.
6. Muscle tissue can be found in a(n) \_\_\_\_\_ body.
7. The flesh of fruits is an example of tissue found in \_\_\_\_\_ .
8. Different tissues working together form a(n) \_\_\_\_\_ .
9. The lungs, heart, and stomach are examples of organs found in \_\_\_\_\_ .

**What are some plant and animal organ systems?**

10. The \_\_\_\_\_ are the main organ in the root system.
11. Plants also have systems for \_\_\_\_\_ materials.
12. The salamander has an organ system that breaks down food for \_\_\_\_\_ .
13. The \_\_\_\_\_ , muscles, and brain are part of the organ systems that control movement and responses.
14. The heart is part of the organ system that \_\_\_\_\_ blood and other materials.

**Summarize the Main Idea**

15. How are cells organized in multicellular organisms?

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## From Cells to Organisms

**a.** unicellular**c.** multicellular**e.** organ**b.** organism**d.** tissue**f.** organ system

### Fill in the blank.

1. \_\_\_\_\_ A group of organs that work together to do a certain job.
2. \_\_\_\_\_ A group of similar cells that do the same job in an organism.
3. \_\_\_\_\_ One-celled organisms that can carry out all of the processes of life.
4. \_\_\_\_\_ Made up of tissues of different kinds that come together to do a particular job.
5. \_\_\_\_\_ Organisms that are made of many different kinds of cells.
6. \_\_\_\_\_ An individual living thing.

## From Cells to Organisms

organisms	multicellular	cells	growth
organ	respiration	tissue	
organ system	response	unicellular	

### Fill in the blanks.

Individual living things are called \_\_\_\_\_ .  
\_\_\_\_\_ are the smallest units that can carry out basic life processes. \_\_\_\_\_ organisms carry out all of the life processes within a single cell. In \_\_\_\_\_ organisms, different kinds of cells work together to carry out its life processes. The ability to increase in size is a life process called \_\_\_\_\_ .  
\_\_\_\_\_ is the ability to react to changes in surroundings. The ability to use oxygen to break down food into energy is called \_\_\_\_\_ . A(n) \_\_\_\_\_ consists of a group of similar cells that do the same job. Tissues combine to make up a(n) \_\_\_\_\_. A(n) \_\_\_\_\_ is a group of organs that work together to do a certain job. Organ systems in the body include the muscular, skeletal, and nervous systems.

# Diversity of Organisms

Use your textbook to help you fill in the blanks.

## How are living things grouped together?

1. Classifying organisms shows which organisms are most \_\_\_\_\_ to one another.
2. In one classification system, the broadest group into which organisms are classified is the \_\_\_\_\_ .
3. A kingdom is divided into smaller groups. Organisms in smaller groups are \_\_\_\_\_ .

## What do animals have in common?

4. All animals (1) have to get energy from eating other things and (2) are \_\_\_\_\_ .
5. An animal that has a backbone is called a(n) \_\_\_\_\_ .

## What do plants have in common?

6. All of the organisms in the plant kingdom produce their own \_\_\_\_\_ .
7. The two major groups of the plant kingdom are vascular and \_\_\_\_\_ plants.

## What are fungi?

8. A fungus absorbs food from decaying or dead organisms in its environment because it cannot \_\_\_\_\_ .

**What are bacteria?**

9. \_\_\_\_\_ are simple, tiny unicellular organisms that do not have a distinct nucleus.
10. Bacteria are classified into two kingdoms called “ancient bacteria” and \_\_\_\_\_ .

**What are protists?**

11. All protists have a distinct \_\_\_\_\_ in their cells and they lack \_\_\_\_\_ .

**Plant-like Protists**

12. Plant-like protists contain colored chemicals that they use to produce their own \_\_\_\_\_ .
13. An example of a plant-like protist is \_\_\_\_\_ .

**Animal-like Protists**

14. Animal-like protists eat food by absorbing it into their cells through their \_\_\_\_\_ .

**Fungi-like Protists**

15. These protists act like fungi and get their food by breaking down \_\_\_\_\_ .

**Summarize the Main Idea**

16. How are classification systems used to group living things?

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## Diversity of Organisms

- |                       |                    |                        |
|-----------------------|--------------------|------------------------|
| <b>a.</b> vertebrate  | <b>d.</b> protist  | <b>g.</b> invertebrate |
| <b>b.</b> nonvascular | <b>e.</b> bacteria | <b>h.</b> vascular     |
| <b>c.</b> fungus      | <b>f.</b> kingdom  |                        |

### Fill in the blank.

1. \_\_\_\_\_ The broadest group of classification.
2. \_\_\_\_\_ An animal that has a backbone.
3. \_\_\_\_\_ An animal without a backbone.
4. \_\_\_\_\_ Plants with tubes that transport food and water.
5. \_\_\_\_\_ Plants that transport water and other substances directly from the ground into their cells.
6. \_\_\_\_\_ A unicellular or multicellular organism that absorbs food from dead or decaying organisms in its environment.
7. \_\_\_\_\_ Simple, tiny unicellular organisms with cell membranes and cytoplasm but no distinct nuclei.
8. \_\_\_\_\_ A unicellular or multicellular organism with a distinct nucleus that does not have specialized tissues.

# Diversity of Organisms

bacteria	kingdom	similarities
food	nonvascular	vascular
invertebrates	protists	vertebrates

**Fill in the blanks.**

Scientists have created classification systems that put organisms into groups. When scientists classify organisms, they put them into groups based on shared \_\_\_\_\_. In one widely used classification system, the broadest group is a(n) \_\_\_\_\_. In the animal kingdom, \_\_\_\_\_ have backbones, but \_\_\_\_\_ do not. The plant kingdom also divides into two groups. These are \_\_\_\_\_ and \_\_\_\_\_. Fungi cannot make \_\_\_\_\_, so they absorb it from dead or decaying organisms in the environment. Ancient \_\_\_\_\_ are the oldest living organisms on earth. \_\_\_\_\_ can be plant-like, animal-like, or fungi-like. Most of these organisms live in the water.

## Meet Angelique Corthals

Read the Reading in Science feature in your textbook.



### Write About It

**Summarize** Make a chart that tells the steps for preserving cells. Use your chart to write a summary of the process Angelique uses to freeze cells from organisms.

Steps for Preserving Cells
1.
2.
3.
4.

Now summarize, in your own words, what the reading detailed about the steps Angelique uses to preserve cells.

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# A Tale of Two Animals

Read the Writing in Science feature in your textbook.



## Write About It

**Fictional Writing** Choose two other organisms that are very different from each other. Write a fictional narrative in which these two organisms are in conflict.

### Planning and Organization

Cyndi started her story by introducing one of her two main characters: Gila Monster. Here are five sentences that she wrote. Put them in chronological order. Write 1 by the event that comes first, 2 by the event that comes second, and so on. The last event should be numbered 5.

1. Then Gila Monster seized a small jackrabbit. \_\_\_\_\_
2. Gila Monster stuck out his long, sensitive tongue to sense for prey. \_\_\_\_\_
3. Now that warm weather had come, Gila Monster spent his nights searching for small mammals, birds, and prey. \_\_\_\_\_
4. Gila Monster sunk his teeth into the rabbit and started to chew, sending his poisonous venom into the rabbit. \_\_\_\_\_
5. During the winter, Gila Monster did not need to find much food, because of all the fat stored in his tail. \_\_\_\_\_

### Getting Ideas

Cyndi chose to center the plot for her story on a conflict between Gila Monster and Tarantula. Think about the similarities and differences of your two characters. How do they bring the characters into conflict? What events might occur that will resolve this conflict? Use the chart on the following page to plan your story.

**Characters/Setting**

\_\_\_\_\_

**Conflict**

\_\_\_\_\_

**Event 1**\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_**Event 2**\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_**Event 3/Resolution**\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Now write your short story on a separate sheet of paper. Describe the setting, introduce the characters, set up the conflict, and show the events that lead to the resolution.

**Revising and Proofreading**

Cyndi chose to use dialogue in her story. Here is a passage from her story. Proofread it. Correct any punctuation and capitalization problems.

After eating, Gila Monster said I think I will curl up and sleep by that big rock. He added then I'll hunt again when night falls.

Who's invading my home hissed Tarantula from under the rock? He said to himself doesn't everyone know that I like to live alone?

Then the three-inch spider crept out from under the rock, saw the two-foot-long lizard, and said well I guess I won't be able to wrap him in a ball of silk and save him for a later meal!

**Now revise and proofread your own story. Ask yourself:**

- Have I created two characters that are very different from each other?
- Have I provided a sequence of events that leads to a believable resolution of the conflict?
- Have I corrected any grammar problems?
- Have I corrected any errors in spelling, punctuation, and capitalization?

# Structure of Living Things

Choose the letter of the best answer.

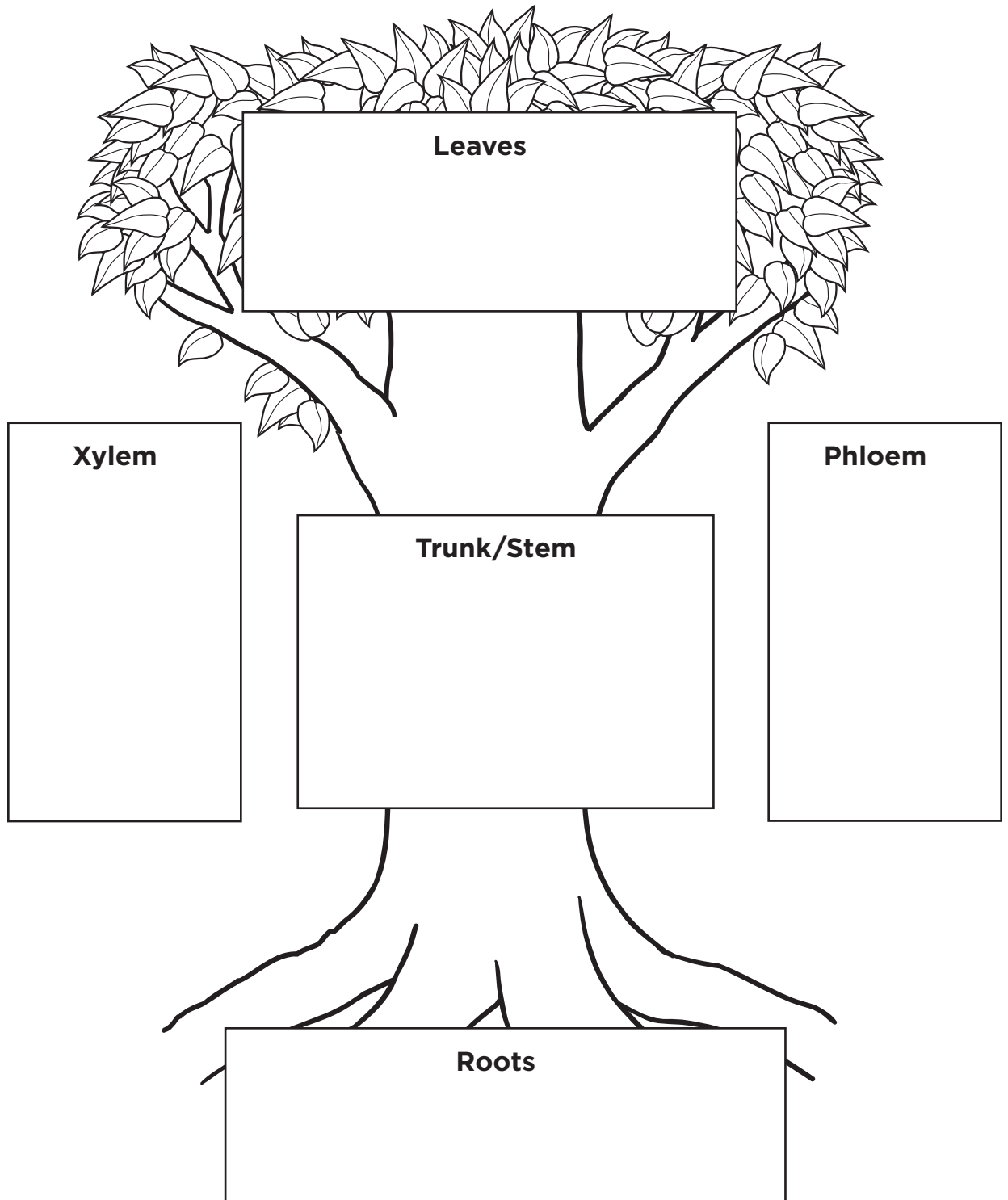
- One widely accepted classification system divides living things into six
  - cells.
  - kingdoms.
  - organs.
  - vertebrates.
- The part of a cell that controls all of its activity is the
  - cell wall.
  - cytoplasm.
  - nucleus.
  - vacuole.
- Structures in plant cells that turn energy from sunlight into food are called
  - chloroplasts.
  - cell walls.
  - cytoplasm.
  - mitochondria.
- An individual living thing is a(n)
  - nucleus.
  - invertebrate.
  - organism.
  - vertebrate.
- An animal that has a backbone is called a(n)
  - bacterium.
  - invertebrate.
  - protist.
  - vertebrate.
- The smallest unit of a living thing that carries out basic life processes is a(n)
  - cell.
  - cell membrane.
  - cell wall.
  - chloroplast.
- In living things, tissues of different kinds come together to make up a(n)
  - organ.
  - organism.
  - organ system.
  - tissue.
- The outside layer that controls what moves in and out of the cell is its
  - cell membrane
  - tissue
  - cytoplasm
  - nucleus

**Choose the letter of the best answer.**

9. What cell parts break down food and turn it into energy for the cell to use?
  - a. cytoplasm
  - b. mitochondria
  - c. nucleus
  - d. vacuole
  
10. Structures in cells that store water, food, and wastes are called
  - a. chloroplasts.
  - b. cytoplasm.
  - c. mitochondria.
  - d. vacuoles.
  
11. Organisms that are made of many different kinds of cells are called
  - a. invertebrate.
  - b. multicellular.
  - c. unicellular.
  - d. vertebrate.
  
12. Unicellular organisms that have cytoplasm, but no distinct nucleus are
  - a. bacteria.
  - b. fungi.
  - c. plants.
  - d. protists.
  
13. The gel-like substance in a cell that supports all of the cell structures is the
  - a. cell wall.
  - b. chloroplast.
  - c. cytoplasm.
  - d. mitochondria.
  
14. A one-celled organism is
  - a. monocellular.
  - b. multicellular.
  - c. single cellular.
  - d. unicellular.
  
15. Plants that do not have tubes to transport water and food are
  - a. multivascular.
  - b. invascular.
  - c. nonvascular.
  - d. vascular.
  
16. A group of organs that work together to do a certain job are a(n)
  - a. organ.
  - b. organ system.
  - c. structure.
  - d. tissue.
  
17. An animal without a backbone is called a(n)
  - a. invertebrate.
  - b. nonvascular.
  - c. unicellular.
  - d. vertebrate.

# Plant Structures and Functions

Complete the concept map with the information you learned about plant structures and functions.



# Branches

Read the Literature feature in your textbook.



## **Write About It**

**Response to Literature** The poet creates a vivid impression of a leaf collecting light and water. Do print and online research to find out what happens as a plant grows new leaves. Then write an explanation of this sequence of events.

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# Vascular Plants

Use your textbook to help you fill in the blanks.

## How are vascular plants classified?

1. Vascular plants have \_\_\_\_\_ that work together to transport water, food, and waste to all parts of the plant.
2. Scientists separate vascular plants into seedless plants and \_\_\_\_\_.
3. Scientists then divide plants with seeds into plants that produce flowers and \_\_\_\_\_.

## How are seedless and seed plants different?

4. A seed contains an \_\_\_\_\_ and stored food used to develop and grow into a new plant.
5. This new plant shares the \_\_\_\_\_ of the two plants that produced the seed.
6. Some vascular plants do not \_\_\_\_\_, or grow from them, they grow from spores.
7. A \_\_\_\_\_ is a single cell that can develop into new plant that is exactly like the plant that produced it.

## Seed plants

8. Angiosperms are seed plants that \_\_\_\_\_.
9. \_\_\_\_\_, and almost all nuts come from angiosperms.
10. Gymnosperms are seed plants that \_\_\_\_\_.
11. \_\_\_\_\_ produce seeds inside a cone.
12. Most gymnosperms are \_\_\_\_\_, trees that lose only a few leaves at one time and constantly replace the leaves they have lost.

**What do flowers do?**

- 13.** Flowers, the reproductive organ of angiosperms, usually have both \_\_\_\_\_ parts.
- 14.** Pollen grains are transferred from a flower's \_\_\_\_\_ to the female part of the flower, the *pistil*, or to another flower's pistil.
- 15.** This transfer is called \_\_\_\_\_ .
- 16.** During fertilization, the pollen and egg cell join, and \_\_\_\_\_ .
- 17.** As the seed develops, the ovary enlarges until it becomes a \_\_\_\_\_ , which protects the seeds inside it.
- 18.** Many flowers smell sweet, while other flowers can imitate the smell of \_\_\_\_\_ to attract beetles and flies.

**Summarize the Main Idea**

- 19.** What are two ways scientists divide vascular plants?

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## Vascular Plants

- |                       |                       |                    |
|-----------------------|-----------------------|--------------------|
| <b>a.</b> angiosperms | <b>d.</b> gymnosperms | <b>g.</b> spore    |
| <b>b.</b> capsule     | <b>e.</b> nonvascular | <b>h.</b> vascular |
| <b>c.</b> evergreens  | <b>f.</b> seed        |                    |

### Fill in the blanks.

1. \_\_\_\_\_ Seed plants that do not produce flowers.
2. \_\_\_\_\_ Seed plants that produce flowers.
3. \_\_\_\_\_ Filled with thousands of tiny spores.
4. \_\_\_\_\_ A single cell that can develop into a plant that is exactly like the plant that produced it.
5. \_\_\_\_\_ Contains an undeveloped plant and stored food.
6. \_\_\_\_\_ Plants that have specialized cells which work together to transport water, food, and waste.
7. \_\_\_\_\_ Plants such as mosses, hornworts, and liverworts also grow from spores.
8. \_\_\_\_\_ Trees that lose only a few leaves at one time and constantly replace the leaves they have lost.

## Vascular Plants

angiosperms	produce	spores
flowers	seedless	undeveloped
gymnosperms	specialized cells	vascular

### Fill in the blanks.

Many different kinds of plants grace our planet, and we have to be able to identify special features in them. For example, plants that have \_\_\_\_\_ which work together to transport water, food, and waste to all parts of the plant, are called \_\_\_\_\_ plants. Scientists have separated vascular plants into two categories: \_\_\_\_\_ plants, and plants with seeds. Most common plants such as fruits, vegetables, and herbs, \_\_\_\_\_ seeds. Seeds contain an \_\_\_\_\_ plant and stored food. Some vascular plants, such as horsetails, club mosses, spike mosses, and ferns, do not produce seeds or grow from them. Instead, these plants grow from \_\_\_\_\_. Some plants with seeds produce \_\_\_\_\_ and some do not. \_\_\_\_\_ are seed plants that produce flowers. Flowers are the reproductive organ of angiosperms. \_\_\_\_\_ are seed plants that do not produce flowers. These plants produce seeds inside a cone.

# Plant Transport Systems

Use your textbook to help you fill in the blanks.

## How do plants move materials?

1. \_\_\_\_\_ move up from the roots into the leaves.
2. Sugar is transported from the \_\_\_\_\_ to the roots or other parts of the plant.
3. A root is the part of a plant that absorbs water and minerals, stores food, and \_\_\_\_\_.
4. A stem is the main stalk of a plant. The stem develops \_\_\_\_\_ and usually grows above the ground.
5. Inside the stem, materials \_\_\_\_\_ up and down through the transport system.
6. The leaf uses water and carbon dioxide to \_\_\_\_\_, which the transport system moves throughout the plant so other plant cells can use it as food.

## What is the transport system made of?

7. Under a microscope, you can see the \_\_\_\_\_ that form the transport system.
8. Xylem moves water and minerals \_\_\_\_\_.
9. Phloem moves food from the plant's \_\_\_\_\_ to its other parts.
10. Many woody stems have a layer of cells called the cambium that separates the \_\_\_\_\_ from the \_\_\_\_\_.
11. Bark is a tough outer covering that serves as a \_\_\_\_\_ for the tree.

**12.** Each year, a new layer of xylem forms an \_\_\_\_\_ .

**How are roots different?**

**13.** Taproots have one large root with a \_\_\_\_\_ .

**14.** \_\_\_\_\_ are made up of thin, branching roots.

**15.** Prop roots grow like fingers out of the \_\_\_\_\_ .

**16.** Some plants have \_\_\_\_\_ , or roots that never touch the ground.

**Summarize the Main Idea**

**17.** Describe the transport system in vascular plants.

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## Plant Transport Systems

- |                   |                           |                 |
|-------------------|---------------------------|-----------------|
| <b>a.</b> cambium | <b>d.</b> roots           | <b>g.</b> veins |
| <b>b.</b> leaf    | <b>e.</b> stem            | <b>h.</b> xylem |
| <b>c.</b> phloem  | <b>f.</b> vascular plants |                 |

### Fill in the blanks.

1. \_\_\_\_\_ Plants that constantly move materials through the specialized cells in their transport system.
2. \_\_\_\_\_ Part of a plant that absorbs water and minerals, stores food, and holds the plant in place.
3. \_\_\_\_\_ The main stalk of a plant.
4. \_\_\_\_\_ Uses water and carbon dioxide to produce sugar.
5. \_\_\_\_\_ Transports minerals throughout the leaves.
6. \_\_\_\_\_ Moves water and minerals up from the roots.
7. \_\_\_\_\_ Moves food from the plant's leaves to its other parts.
8. \_\_\_\_\_ Where new xylem and phloem are produced.

## Plant Transport Systems

cambium

roots

transport system

leaf

sugar

vacuoles

microscope

tissue

water and minerals

### Fill in the blanks.

How does a vascular plant eat and grow? Vascular plants are constantly moving materials through the specialized cells in their \_\_\_\_\_ . The \_\_\_\_\_ absorb water and minerals from the soil. Then, \_\_\_\_\_ travel up through the stem and into the leaves. When sunlight hits a \_\_\_\_\_ , it uses photosynthesis to make sugar from water and carbon dioxide. Then, the leaf sends \_\_\_\_\_ to the rest of the plant for nutrition. When you cut a thin slice of a plant stem or root, and look at it under a \_\_\_\_\_ , you can see the tissues that form the transport system. As water moves up the plant, some of it is stored in the \_\_\_\_\_ , or spaces, of the xylem tissue cells. The other transport system \_\_\_\_\_ is phloem. It moves food from the plant's leaves to its other parts. Many woody stems have a layer of cells that separate the xylem from the phloem, called the \_\_\_\_\_ .

# Photosynthesis and Respiration

Use your textbook to help you fill in the blanks.

## What do leaves do?

1. Leaves use energy from the Sun to make food from water and carbon dioxide in a process called \_\_\_\_\_ .
2. Photosynthesis is carried out in the \_\_\_\_\_ of the cells that are underneath the epidermis.
3. Chloroplasts contain chlorophyll, which is the chemical that absorbs and stores the \_\_\_\_\_ .
4. Tiny pores, called stomata, in the bottom of leaves take in \_\_\_\_\_ from the air.
5. When a plant has enough water, the \_\_\_\_\_ swell and pull open the stomata so the plant can breathe.

## What is photosynthesis?

6. Photosynthesis means “ \_\_\_\_\_ .”
7. Scientists express what happens during photosynthesis using this chemical equation: \_\_\_\_\_ .
8. During photosynthesis, plants produce \_\_\_\_\_ , a compound made from carbon, hydrogen, and oxygen.
9. Cellulose, the main substance that makes up the \_\_\_\_\_ in plants, is a carbohydrate.
10. When plants store sugar, they store it as starch, a molecule made up of \_\_\_\_\_ .
11. When you eat a vegetable, your body \_\_\_\_\_ from the carbohydrates stored in the plant.

**Where does respiration happen?**

- 12. When the plant needs energy to grow or repair itself, starches and sugars are broken down in a process called \_\_\_\_\_ .
- 13. The chemical equation for cellular respiration is:  $C_6H_{12}O_6 + O_2 = 6CO_2 + 6H_2O + \text{energy}$ , which means sugar + oxygen = \_\_\_\_\_ .
- 14. Cellular respiration takes place in the \_\_\_\_\_ .
- 15. Photosynthesis produces food that stores energy, while \_\_\_\_\_ releases energy.

**Summarize the Main Idea**

- 16. How do plants make and use energy?  
\_\_\_\_\_  
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# Photosynthesis and Respiration

- |  |                        |                          |
|--|------------------------|--------------------------|
| <b>a.</b> $\text{CO}_2 + \text{energy (sun)} + \text{H}_2\text{O} = \text{sugar} + \text{O}_2$ | <b>f.</b> chloroplasts |                          |
| <b>b.</b> carbohydrate   | <b>d.</b> cellulose    | <b>g.</b> photosynthesis |
| <b>c.</b> cellular respiration   | <b>e.</b> chlorophyll  | <b>h.</b> stomata        |

## Fill in the blanks.

- \_\_\_\_\_ The process that uses energy from the Sun to make food from water and carbon dioxide.
- \_\_\_\_\_ Photosynthesis is carried out in these, which are located in the cells that are underneath the epidermis.
- \_\_\_\_\_ The chemical that absorbs and stores the energy of sunlight.
- \_\_\_\_\_ Tiny pores in the bottom of leaves take in carbon dioxide from the air.
- \_\_\_\_\_ A compound made from carbon, hydrogen, and oxygen.
- \_\_\_\_\_ The main substance that makes up the cell wall in plants.
- \_\_\_\_\_ Starches and sugars are broken down in the cells in this process.
- \_\_\_\_\_ Scientists express what happens during photosynthesis using this chemical equation.

## Photosynthesis and Respiration

carbohydrate

chloroplasts

starch

cellular respiration

energy

stomata

chlorophyll

photosynthesis

water

### Fill in the blanks.

How does the Sun give you the energy you need to do your school work? When a plant gets enough water, the guard cells in the leaf swell and pull open the \_\_\_\_\_. The Sun shines on the plant so its leaves can make food from \_\_\_\_\_ and carbon dioxide. This process is called \_\_\_\_\_, which means “putting together by light.” Photosynthesis takes place in the \_\_\_\_\_ of the cells underneath the epidermis, or skin of the leaf. Chloroplasts contain \_\_\_\_\_, a green chemical that absorbs and stores the energy of sunlight. Sugar is a \_\_\_\_\_ made from carbon, hydrogen, and oxygen. Plants store sugar as a \_\_\_\_\_. When the plant needs energy to grow or repair itself, it breaks down starches and sugars in a process called \_\_\_\_\_. When you eat a vegetable, or when you eat meat from an animal that eats plants, your body gets \_\_\_\_\_ from the sugars and carbohydrates stored in the plant.

## A Year in the Life of a Forest

Did you know that forests breathe? Scientists can measure the gases in the forest air to gather data about the photosynthesis and respiration of the trees, animals, and other organisms that live there.

Take a look at the carbon dioxide data that scientists measured in the air from Howland Forest, a deciduous forest in Maine. Howland Forest has cold and snowy winters and hot and humid summers. How do these changes in seasons affect the amount of carbon dioxide in the air?

### Spring

As the days become longer and warmer, activity in the forest grows. This increased activity results in higher levels of respiration, so the amount of carbon dioxide measured in the air starts to rise. The trees sprout new leaves and begin to photosynthesize.

### Summer

Summer days are the longest and warmest of the year. Because the forest is so active, a lot of photosynthesis and respiration occurs. During the day, the amount of carbon dioxide is low. That's because the trees are transforming the carbon dioxide into food to store in their roots. During the night, the amount of carbon dioxide is high. That's because all of the life forms in the forest are still respiring, and the trees are not photosynthesizing. These two processes together result in the different day and night carbon dioxide levels you see in the graph.

### Fall

Shorter days mean fewer hours of sunlight. Trees begin to lose their leaves and the forest becomes less active. The forest is photosynthesizing and respiring less. Day and night carbon dioxide levels become more similar.

### Winter

Winter days are the shortest and coldest of the year. The forest is much less active. Most of the trees have lost their leaves, and there is no photosynthesis. Day and night carbon dioxide levels are very similar as all the life forms continue to respire.

**Sequence of Events**

- The sequence of events is the order in which events happen in time.
- Look for the event that happens first, then fill in what happens next and last.

**Write About It**

**Sequence** Create a sequence of events timeline based on the information in the article. Tell what happens first, next, and last as the seasons change in Howland Forest. Then use your timeline and the chart from the article to summarize the data collected from Howland Forest.

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# Saving Water the Yucca Plant Way

Read the Writing in Science feature in your textbook.



## Write About It

**Explanatory Writing** Write an article for young gardeners. Explain the process of CAM photosynthesis. Research facts and details for your article.

## Planning and Organizing

Help Ray create an outline for his article. Here are some topics he wants to cover. Place them in the outline form below.

- What happens during the day in CAM photosynthesis?
- What is the purpose of CAM photosynthesis?
- What is photosynthesis?
- What happens at night during CAM photosynthesis?
- How does the process of CAM photosynthesis work?

I. \_\_\_\_\_

II. \_\_\_\_\_

III. \_\_\_\_\_

A. \_\_\_\_\_

B. \_\_\_\_\_

IV. Why is the yucca plant special?

Now create an outline for your own article on a separate sheet of paper. Make it as detailed as possible. Add A, B, C points and subpoints (1, 2, 3) under these as necessary.

Now use a separate sheet of paper to write the first draft of your article.

### Revising and Proofreading

Here is part of the report that Ray wrote. Help him combine his sentences. Use the transition word in parentheses. Make sure you punctuate the new sentence correctly.

1. In CAM photosynthesis, the stomates open at night. The air is cooler and the humidity is higher. (when)

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2. It needs to avoid losing water. The yucca plant closes its stomates during the day. (because)

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3. CAM photosynthesis is effective. It results in more efficient water use. (since)

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Now revise and proofread your article. Ask yourself:

- Have I introduced my main idea about photosynthesis in yuccas?
- Have I included facts and details to show how this process works?
- Have I used examples and language appropriate for my audience?
- Have I used transition words and phrases to connect ideas?
- Have I ended with a strong conclusion about why yucca plants are special?
- Have I corrected all grammar errors?
- Have I corrected all problems in spelling, punctuation, and capitalization?

## Plant Structures and Functions

Choose the letter of the best answer.

1. What food do plants produce during photosynthesis?
  - a. carbohydrates
  - b. seeds
  - c. spores
  - d. starch
2. Seed plants that produce flowers are
  - a. angiosperms.
  - b. cambium.
  - c. gymnosperms.
  - d. phloem.
3. What tissue moves food from a plant's leaves to its other parts?
  - a. cambium
  - b. phloem
  - c. vein
  - d. xylem
4. An undeveloped plant and stored food is contained in a(n)
  - a. angiosperm.
  - b. gymnosperm.
  - c. seed.
  - d. spore.
5. Energy stored during photosynthesis is released during a process called
  - a. carbohydrate.
  - b. cellular inspiration.
  - c. cellular perspiration.
  - d. cellular respiration.
6. New xylem and phloem are produced in the
  - a. cambium.
  - b. photosynthesis.
  - c. seed.
  - d. spore.

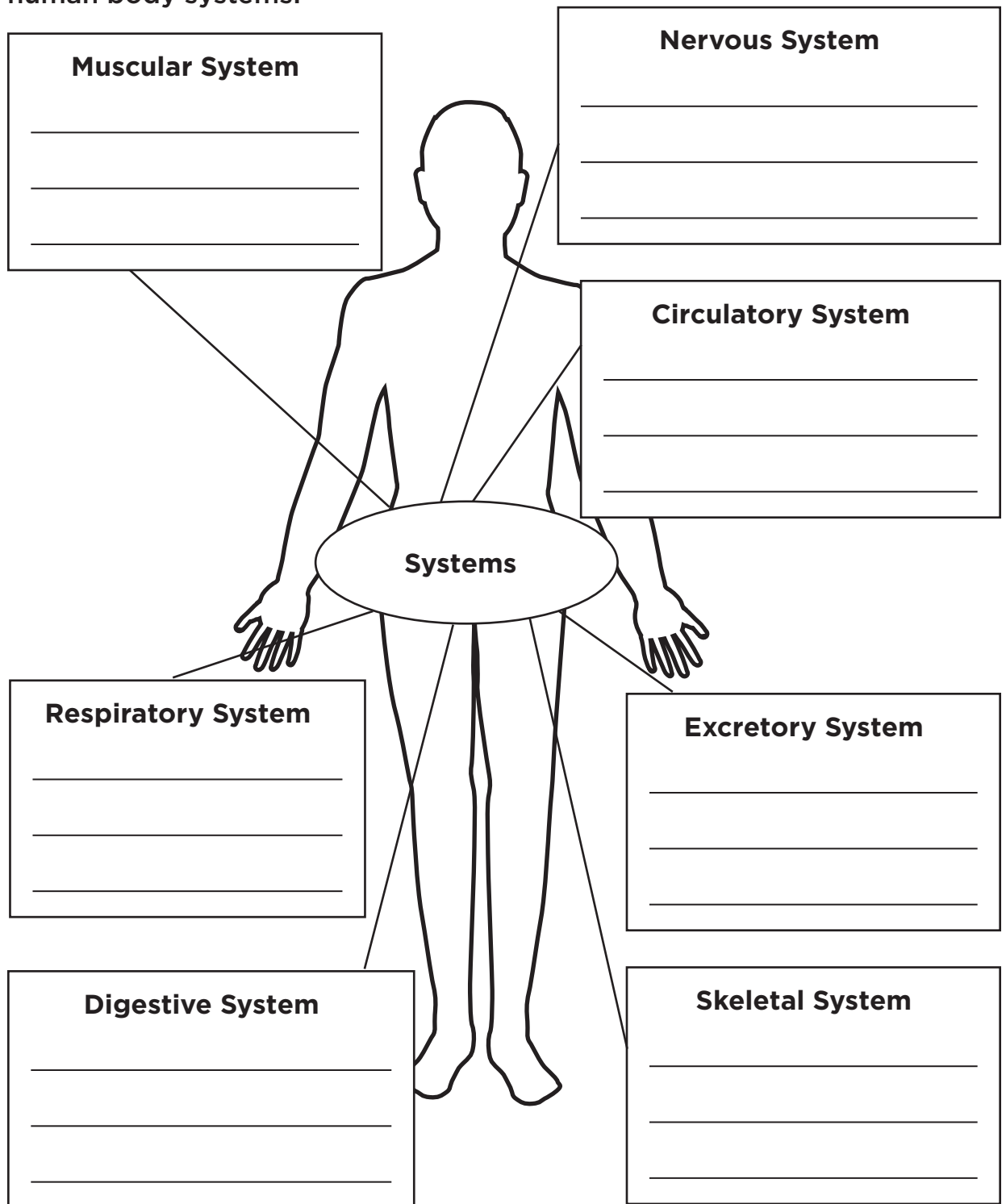
**Choose the letter of the best answer.**

- 7.** When plants store sugar, they store it as
- a.** carbohydrates.
  - b.** seeds.
  - c.** spores.
  - d.** starch.
- 8.** Seed plants that do not produce flowers are
- a.** angiosperms.
  - b.** gymnosperms.
  - c.** phloem.
  - d.** xylem.
- 9.** Leaves use energy from the Sun to make food for a plant during the process of
- a.** cellular inspiration.
  - b.** cellular respiration.
  - c.** photogenesis.
  - d.** photosynthesis.
- 10.** A single cell that can develop into a new plant exactly like the old plant is a(n)
- a.** capsule.
  - b.** seed.
  - c.** spore.
  - d.** unicell.
- 11.** What tissue moves water up from a plant's roots?
- a.** cambium
  - b.** phloem
  - c.** vein
  - d.** xylem



# Human Body Systems

Complete the concept map with the information you learned about human body systems.



# Bigger Muscles or a Stronger Heart?

Read the Literature feature in your textbook.



## Write About It

**Response to Literature** In this article, you learned about the difference between aerobic and anaerobic exercise. Write a summary. Start by telling the main idea of the article. Then include important facts and details. Reach a conclusion at the end.

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# The Human Body

Use your textbook to help you fill in the blanks.

## How is the human body organized to carry out life processes?

1. A group of similar cells that work together to carry out a function make up a(n) \_\_\_\_\_ .
2. Different tissues are organized into various \_\_\_\_\_ .
3. The organs then work together as part of a(n) \_\_\_\_\_ to perform specific activities or \_\_\_\_\_ .

## Which organ systems are involved in protecting the body?

4. The \_\_\_\_\_ system includes skin and hair that cover your body and act as a barrier to protect it.
5. The \_\_\_\_\_ helps your body to heal and prevents it from getting sick.

## Which organ systems are involved in controlling the body?

6. The \_\_\_\_\_ carries messages from one part of the body to another and controls your senses.
7. The \_\_\_\_\_ system controls the body's growth and responses.

## Which organ systems are involved with supporting and moving the body?

8. The \_\_\_\_\_ system tightens and releases \_\_\_\_\_ to move body parts.
9. The \_\_\_\_\_ gives the body its shape, protects organs, and works with muscles to move the body.

**Which organ systems are involved in moving necessary materials into, through, and out of the body?**

10. The \_\_\_\_\_ carries oxygen into the lungs where it is transferred to the blood.
11. The \_\_\_\_\_ moves oxygen and nutrients to the cells, and takes carbon dioxide and waste from the cells.
12. The \_\_\_\_\_ system moves waste materials out of the body.
13. The \_\_\_\_\_ turns the food you eat into nutrients that are suitable for use by the body's cells.

**Which of the body's organ systems are activated during these activities?**

14. The \_\_\_\_\_ system is activated when you are suddenly frightened; it gives you the ability to run away fast.
15. The \_\_\_\_\_ is activated when you eat an apple; it breaks down the food for use by your cells.
16. The \_\_\_\_\_ is activated when you sweat; it carries waste from your body.
17. The \_\_\_\_\_ is activated when you respond to catch a ball; it sends messages to your muscles telling you to move your hands.

**Summarize the Main Idea**

18. How is the body organized to carry out life processes?

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# The Human Body

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RAIH 

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Unscramble the words using the hints, then solve the puzzle.

1. The respiratory system brings in oxygen and takes out \_\_\_\_\_ dioxide.
2. The \_\_\_\_\_ system moves nutrients into cells and waste out of cells.
3. The \_\_\_\_\_ system turns food into nutrients for the cells.
4. A person with a strong \_\_\_\_\_ system does not catch many colds.
5. The body's integumentary system includes its skin and \_\_\_\_\_ .

It works like a well-oiled machine when all its systems work together. It's the

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## The Human Body

cells	excretory system	organs
circulatory system	nervous system	organ system
digestive system	immune system	respiratory system
endocrine system	integumentary system	

### Fill in the blanks.

The human body is well equipped to carry out all the necessary processes of life. The body has similar \_\_\_\_\_, which work together and make up a tissue. Different tissues are organized into \_\_\_\_\_. A complex activity, such as the breakdown of food for use by the cells, requires a(n) \_\_\_\_\_. This specific function is performed by the \_\_\_\_\_. Other organ systems are involved in the transport of materials into, through, and out of the body. These systems are the \_\_\_\_\_, the \_\_\_\_\_, and the \_\_\_\_\_. Two organ systems that control the body's activities are the \_\_\_\_\_ and the \_\_\_\_\_. Two other organ systems that protect the body are the \_\_\_\_\_ and the \_\_\_\_\_. To do all the wonderful things that humans do, it is necessary that all the body's organ systems work together.

# The Digestive System

Use your textbook to help you fill in the blanks.

## Where do cells get energy to do work?

1. Your cells get energy from the \_\_\_\_\_ you eat.
2. \_\_\_\_\_ breaks down big food into simple substances so that tiny \_\_\_\_\_ can use it.
3. The body breaks down food both physically and \_\_\_\_\_ .
4. The body's \_\_\_\_\_ produce chemicals to help break down food.

## Where does digestion begin?

5. When you bite into food, your teeth tear and grind the food into a small ball called a(n) \_\_\_\_\_ .
6. Your \_\_\_\_\_ , attached to the back of your mouth, has many \_\_\_\_\_ that allow you to taste sweet, salty, sour, and bitter things.
7. When the bolus is moved to the \_\_\_\_\_ or throat, it is finally swallowed into the \_\_\_\_\_ , the long muscular tube that connects to the stomach.

## What are the special functions of various teeth in breaking down food?

8. The teeth used for biting food are found in the front of the mouth and are called \_\_\_\_\_ .
9. The \_\_\_\_\_ , the flat teeth in the back of your mouth, are used for crushing and grinding food.

**What happens to food once it is swallowed and goes into the esophagus?**

10. The esophagus is lined with \_\_\_\_\_, which makes the inside slippery.
11. Muscles in the esophagus squeeze the food and move it along to the \_\_\_\_\_.
12. After 4 to 6 hours in the stomach, the food is released into the \_\_\_\_\_.
13. Finally the nutrients are absorbed inside the small intestine, which has hairy finger-like bumps called \_\_\_\_\_.

**What happens to the food that is not absorbed?**

14. Food that could not be digested moves along to the \_\_\_\_\_.
15. The \_\_\_\_\_ is the widest part of the large intestine.

**Summarize the Main Idea**

16. What are the basic steps of the digestion process?

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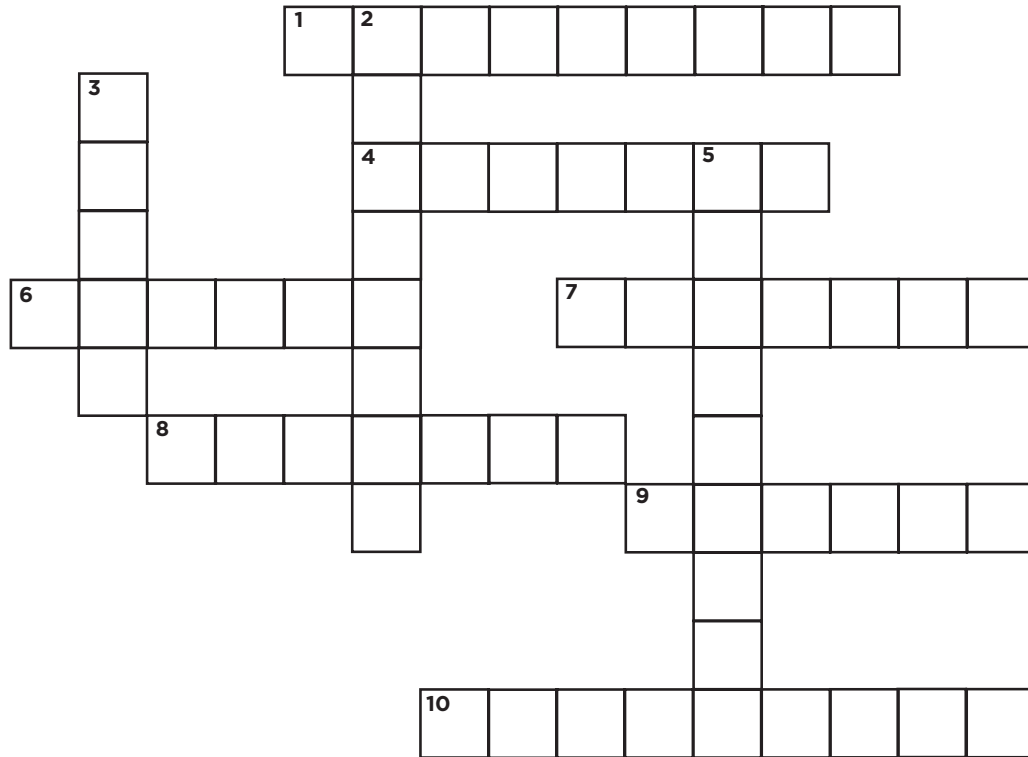
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# The Digestive System

Use the following hints to fill in the crossword puzzle.



## Across

1. the process that breaks down food into simple substances
4. pointy teeth used for cutting and tearing food
6. flat back teeth used for crushing and grinding food
7. has muscles that squeeze and mix food, as well as acids that break it down
8. another name for throat

9. found in the mouth, it starts softening food, breaking it down chemically
10. an organ that has villi to absorb the nutrients

## Down

2. front teeth used for biting food
3. the widest part of the large intestine
5. a muscular tube that connects your mouth to your stomach

## The Digestive System

bile	colon	large intestine	small intestine
bolus	energy	molars	stomach
canines	esophagus	rectum	villi
chemically	incisors	saliva	

### Fill in the blanks.

The function of the digestive system is to break food down so that the cells can use it. Food supplies \_\_\_\_\_ to the cells. Digestion begins in the mouth with the teeth where \_\_\_\_\_ bite the food, and \_\_\_\_\_ cut and tear it. \_\_\_\_\_ grind and crush the food into a small ball called \_\_\_\_\_. \_\_\_\_\_, a liquid found in the mouth, softens the bolus and starts breaking it down \_\_\_\_\_. Swallowed food moves down the \_\_\_\_\_ to the \_\_\_\_\_. In the stomach the liver adds \_\_\_\_\_ and the pancreas adds other digestive juices that break food down into a soupy liquid. Then the food moves to the \_\_\_\_\_ where it can be absorbed into the body through \_\_\_\_\_. The leftover food that could not be digested moves to the \_\_\_\_\_, which has the \_\_\_\_\_ as its widest part. The last part of the large intestine is the \_\_\_\_\_.

## Meet George Barrowclough

When most people think of predators, they picture long, sharp teeth that can rip into flesh. But did you know that some predators, like owls, have no teeth at all? An owl is a predator, an animal that hunts other animals, that eat and digest their food in an interesting way.

George Barrowclough is an ornithologist at the American Museum of Natural History. An ornithologist is a scientist who studies birds. He investigates a bird called the Northern spotted owl, found only in California, Oregon, Washington, and parts of Canada. Northern spotted owls are excellent hunters. They catch mostly rodents, including flying squirrels, woodrats, and mice.

### Owl Pellets

When you eat, you chew first to break the food apart before swallowing it down to your stomach. Most of the time, when an owl eats a mouse, it swallows it whole. Then it relies on a part of its stomach called the gizzard to break the food down. The gizzard has digestive fluids that dissolve all of the soft tissue of the mouse.

The skeleton, teeth, fur, and claws don't have a lot of nutrients and are very hard for the owls to digest. So instead they are squeezed into a tight ball in the gizzard. Several hours later, the owl closes its eyes, coughs it up, and spits it out. This mass of mixed-up fur and bones is called a pellet.

Owl pellets may look gross to some people, but scientists like George find them fascinating. That's because scientists get a lot of information from owl pellets. They can find out what kinds of animals the owls prey on and how they hunt. This information is especially important because the Northern Spotted Owl is an endangered species of bird. The more we learn about these owls and what they need to survive, the better we are able to protect them.

**Main Idea and Details**

- Look for the central point of a selection to find the main idea.
- Details are important parts of the selection that support the main idea.



**Write About It**

**Main Idea** Think about the article you just read. Look for the main topic or central idea of the article. Write the main idea of the article and give one detail from the article that supports the main idea.

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# The Respiratory System

Use your textbook to help you fill in the blanks.

## What does your respiratory system do?

1. Your cells use \_\_\_\_\_ to break down nutrients and get energy.
2. Nutrients enter the blood through your digestive system, but oxygen enters through your \_\_\_\_\_ system.
3. When you breathe out, \_\_\_\_\_, a gas waste product, is pushed out of the body.

## How does the respiratory system exchange carbon dioxide and oxygen in the blood?

4. In your lungs, air is drawn down through a series of tubes surrounded by \_\_\_\_\_, or tiny blood vessels.
5. Oxygen enters the capillaries and \_\_\_\_\_ from the capillaries passes into the lungs.
6. When you \_\_\_\_\_, the lungs empty of air, which contains the carbon dioxide.
7. The \_\_\_\_\_, a large flat sheet of muscle, controls movement of air in and out of the lungs.

## What are the main steps in respiration?

8. Air flows in through your nose and enters your mouth. It passes through your \_\_\_\_\_, or throat, and over your \_\_\_\_\_, or voice box.
9. A flap of tissue that closes when you swallow to prevent food from entering the airway is called the \_\_\_\_\_.

10. After passing the larynx, air enters the \_\_\_\_\_ , or windpipe, a strong tube that divides into two branches.
11. In the lungs, the branches of the trachea continue to divide into smaller and smaller branches called \_\_\_\_\_ .
12. At the end of the smallest bronchi are tiny, thin sacs called \_\_\_\_\_ , where the gas exchange takes place.
13. The walls of the alveoli are so thin that gases like oxygen and carbon dioxide can pass through them by a process called \_\_\_\_\_ .

**What is cell respiration?**

14. Oxygen in the bloodstream flows into the cell's \_\_\_\_\_ .
15. In the mitochondria, glucose and oxygen react to produce carbon dioxide, water and \_\_\_\_\_ .
16. Energy is stored within a cell in a substance called \_\_\_\_\_ .
17. \_\_\_\_\_ is the breaking down of glucose to release energy for the cell.

**Summarize the Main Idea**

18. What does the respiratory system do?

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# The Respiratory System

GIPDAAHRM 

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ESLUCGO 

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7 9

Unscramble the words using the hints, then solve the puzzle.

1. The large flat muscle that controls your breathing is called the \_\_\_\_\_ .
2. The flap of tissue that closes when you swallow to protect you from choking is the \_\_\_\_\_ .
3. The passage of oxygen or carbon dioxide through a cell membrane is a process called \_\_\_\_\_ .
4. Cellular respiration occurs when cells \_\_\_\_\_ down nutrients to get energy.
5. \_\_\_\_\_ and oxygen react inside a cell's mitochondria to produce carbon dioxide, water, and energy.

The best advice for keeping a healthy respiratory system is:

<small>1</small>	<small>2</small>	<small>3</small>	<small>4</small>

<small>5</small>	<small>6</small>	<small>7</small>	<small>8</small>	<small>9</small>	!

## The Respiratory System

alveoli	diaphragm	glucose	mitochondria
bronchi	diffusion	inhale	respiratory system
carbon dioxide	exhale	lungs	trachea

### Fill in the blanks.

Your cells need oxygen to break down food for energy. Oxygen enters the body through your \_\_\_\_\_. When you \_\_\_\_\_, air passes through your nose and mouth and enters your \_\_\_\_\_, or windpipe. The trachea lets air into your right and left \_\_\_\_\_. The lungs expand as air flows into smaller branched tubes called \_\_\_\_\_. At the end of the bronchi are tiny sacs called \_\_\_\_\_. Here oxygen flows through the alveoli's walls into the blood cells in a process called \_\_\_\_\_. The blood carries a waste product called \_\_\_\_\_ from the blood to the tubes of the lungs. Carbon dioxide is pushed out of the body when the lungs \_\_\_\_\_. The muscle that controls the movement of gases through the lungs is called the \_\_\_\_\_. Oxygen in the blood can flow into a cell's \_\_\_\_\_, where it reacts with a type of sugar called \_\_\_\_\_. This reaction releases energy to the cell.



# The Circulatory System

Use your textbook to help you fill in the blanks.

## What does your circulatory system do?

1. The circulatory system is a transport system that brings materials to \_\_\_\_\_ and from your body's organs, tissues, and \_\_\_\_\_.
2. The circulatory system is made up of the \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
3. Blood from the heart is pumped into \_\_\_\_\_, which carry the blood mixed with oxygen from the heart to the body.
4. Oxygen and nutrients pass from the blood to the body's tissues through the thin walls of the \_\_\_\_\_.
5. The \_\_\_\_\_ take the blood that carries carbon dioxide back from the body to the heart.

## How does carbon dioxide leave the blood and how does oxygen enter?

6. The blood is pumped to the \_\_\_\_\_, where carbon dioxide is exhaled, and oxygen is inhaled.

## What are the parts of the heart and what are their functions?

7. The heart, a fist-sized muscle, is located behind a bone called the \_\_\_\_\_ in the center of your chest.
8. \_\_\_\_\_, a protective sac of tissue, surrounds the heart.
9. Each side has two chambers; the upper chamber, or \_\_\_\_\_, and the lower chamber, or \_\_\_\_\_.

10. Blood coming from the body is \_\_\_\_\_ - poor and \_\_\_\_\_ - rich.
11. The heart pumps the blood to the lungs through the \_\_\_\_\_ .
12. Blood comes back from the lungs to the left side of the heart through the \_\_\_\_\_ .
13. Blood leaves the heart through the \_\_\_\_\_ , an artery, and is pumped to the body.
14. The heart has \_\_\_\_\_ that automatically close to stop blood from flowing in the wrong direction.

**What are the parts of the blood and what are their functions?**

15. \_\_\_\_\_ carry oxygen and carbon dioxide to and from the lungs and the rest of the body.
16. \_\_\_\_\_ are large blood cells that fight germs entering the body; they also break down dead cells.
17. \_\_\_\_\_ are cell fragments that prevent blood from leaking through capillaries.

**Summarize the Main Idea**

18. What does the circulatory system do?

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# The Circulatory System

MIRTUA 

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NILRECTEV 

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NOXYGE 

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TASLELPTE 

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RAIESRET 

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LILPIASACRE 

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Unscramble the words using the hints, then solve the puzzle.

1. The upper chamber of the heart is called the \_\_\_\_\_ .
2. The lower chamber of the heart is called the \_\_\_\_\_ .
3. Blood is \_\_\_\_\_ - poor coming into the right side of the heart from the body.
4. \_\_\_\_\_ are part of the blood formed of small cell fragments. They form clots to stop bleeding.
5. \_\_\_\_\_ are thick-walled blood vessels that carry blood away from the heart.
6. \_\_\_\_\_ are tiny blood vessels that have walls thin enough for carbon dioxide and oxygen to be exchanged.

A strong cardiovascular system is developed through regular \_\_\_\_\_ .

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# The Circulatory System

arteries	capillaries	platelets	white
atrium	carbon dioxide	red	
blood	heart	veins	
blood vessels	oxygen	ventricle	

**Fill in the blanks.**

The circulatory system carries needed supplies like food and oxygen to various organs and tissues, and it takes away wastes. The circulatory system consists of the \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_. The heart itself is divided into four chambers the upper left and right \_\_\_\_\_ and lower left and right \_\_\_\_\_. There are three types of blood vessels: the \_\_\_\_\_ that carry blood to the heart from the body, the \_\_\_\_\_ that carry blood from the heart to the body and the \_\_\_\_\_ that connect the two. An important station in the blood's trip through the body is the lung where \_\_\_\_\_ blood cells get \_\_\_\_\_ and leave \_\_\_\_\_. The blood's \_\_\_\_\_ cells fight germs and break down dead cells. \_\_\_\_\_ keep blood from leaking through the thin walls of the capillaries. They also form scabs that stop cuts from bleeding.

## Meet Adriana Aquino

Water covers about two-thirds of the Earth's surface, and fish live in almost every corner of it. In tropical seas where coral reefs are found, the water is warm. In oceans near the poles, the water is below freezing. How do fish survive in these different conditions?

Adriana Aquino is a scientist at the American Museum of Natural History. She's studied several fish species from around the world. The fish she studies are from many different environments. Adriana specializes in their body structure and form. Some of the fish she is interested in have developed amazing adaptations to their circulatory systems that allow them to live in these different environments.

One of these adaptations allows fish to live in some of the coldest places on Earth, like the icy cold waters of the Arctic and Antarctic oceans. You might think that the fish swimming in water below 0°C would freeze solid, but they do not. What stops them from freezing?

These fish have a special protein in their blood. This “antifreeze” protein in the circulatory systems of these fish stops the blood from freezing. Even a single ice crystal can be deadly to a fish. Once one crystal grows, others can cluster around it, eventually freezing the blood. If the blood freezes, the circulatory system fails. The frozen blood stops circulating and no longer carries oxygen and nutrients to cells. The antifreeze proteins stop this from happening by surrounding any ice crystals and binding to their sides. This stops the crystals from clustering. And that's how these fish can survive in the coldest waters of the world.



# The Excretory System

Use your textbook to help you fill in the blanks.

## What does the excretory system do?

1. The excretory system removes \_\_\_\_\_ from your body.
2. Solid waste leaves the body through the \_\_\_\_\_ system. Carbon dioxide leaves the body through the \_\_\_\_\_ system. Urine leaves through the \_\_\_\_\_ system, and sweat leaves through the \_\_\_\_\_ system.
3. The urinary system includes the \_\_\_\_\_, the \_\_\_\_\_, and the \_\_\_\_\_.

## What organs filter your blood?

4. Before blood moves into the \_\_\_\_\_, it must pass through the liver, which helps the body break down food by producing \_\_\_\_\_.
5. The liver removes unnecessary or even \_\_\_\_\_ substances from the blood and converts the food parts it cannot break down into \_\_\_\_\_.
6. When blood leaves the liver, it contains wastes that need to be \_\_\_\_\_ or separated out.
7. The kidneys are \_\_\_\_\_ organs that \_\_\_\_\_ substances from the blood that the body does not need, and they also \_\_\_\_\_ substances to the blood that the body does need.

**How does the kidney filter blood?**

8. \_\_\_\_\_ are individual, tiny filters in the kidneys that separate waste from the useful materials in the blood.
9. Each nephron has a \_\_\_\_\_ tube that has a \_\_\_\_\_ membrane.
10. As this membrane allows some things to pass but stops others, it gathers all of the unusable waste in a collecting \_\_\_\_\_.
11. The collected wastes are \_\_\_\_\_ and other unusable products, which the kidneys later turn into \_\_\_\_\_.
12. The \_\_\_\_\_ is the tube that carries urine from the bladder to the outside of the body.

**What does sweat do?**

13. Sweat helps the body get rid of wastes and \_\_\_\_\_ by pushing sweat collected in sweat glands up into the pores and then onto the surface of the skin.

**Summarize the Main Idea**

14. Briefly explain the basic jobs of the kidneys, the nephrons, the bladder, and the urethra.

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## The Excretory System

K	B	Q	C	J	B	U	D	Y	K
I	S	L	Z	A	R	M	R	B	I
L	N	G	A	E	E	O	X	Q	D
Z	Z	Q	T	D	T	R	C	U	N
B	F	H	Y	E	D	O	U	C	E
J	R	G	R	V	D	E	Z	G	Y
A	P	C	R	D	S	N	R	H	S
I	X	N	E	P	H	R	O	N	S
E	Y	R	A	N	I	R	U	J	D
A	R	W	H	V	R	V	Z	H	A

Use the clues below to help you find the words hidden in the puzzle.

1. An organ that temporarily stores urine and stretches from the size of a plum to the size of a grapefruit depending on how full it is. \_\_\_\_\_
2. The system that removes waste products from the body. \_\_\_\_\_
3. Bean-shaped organs that filter wastes out of the blood, send useful particles back to the blood, and produce urine. \_\_\_\_\_
4. Individual, tiny filters that separate wastes from useful materials in the blood, and number more than 1 million in each kidney. \_\_\_\_\_
5. What the parts of food that the liver cannot break down are converted into. \_\_\_\_\_
6. The tube that carries urine from the bladder to the outside of the body. \_\_\_\_\_
7. The system that includes the kidneys, bladder, and urinary tract. \_\_\_\_\_

## The Excretory System

artery	kidneys	returned	ureters
bile	nephrons	sweat	useful
ducts	pores	tubes	

### Fill in the blanks.

The job of the excretory system is to get rid of wastes. In the integumentary system, sweat glands push \_\_\_\_\_ that contains wastes to the surface of the skin through \_\_\_\_\_. In the urinary system, waste products are filtered, and useful products are \_\_\_\_\_ to the blood. The process of the urinary system starts when the liver produces \_\_\_\_\_ to break down food. Whatever broken-down food the body cannot use leaves the liver as urea. Next, the blood containing urea flows into the bean-shaped \_\_\_\_\_ through a(n) \_\_\_\_\_ and then to capillaries. Once the blood reaches the \_\_\_\_\_, or individual, tiny filters, it will be separated so that \_\_\_\_\_ materials are sent back to the blood. Wastes will get caught up in \_\_\_\_\_ with semipermeable membranes and then will be held in collecting \_\_\_\_\_. The urea and other wastes reach the bladder through tubes called \_\_\_\_\_. A signal goes to the brain to indicate that the bladder needs to be emptied.

## Dr. Kolff Great Inventor

Read the Writing in Science feature in your textbook.



### Write About It

**Persuasive Writing** Suppose your school wants to give someone an award. Write a letter that persuades your principal to give the award to Dr. Kolff. Use convincing facts and details to back up your arguments.

### Planning and Organizing

Gloria plans to include her opinions or arguments about Dr. Kolff, and then back them up with facts. Here are five sentences that she wrote. Write O by each sentence that gives her opinion. Write F by each statement that gives a fact.

1. \_\_\_\_\_ Dr. Kolff is a dedicated humanitarian whose life demonstrates his concern for human welfare.
2. \_\_\_\_\_ In the midst of the horrors of World War II, Dr. Kolff started the first blood bank on the continent of Europe.
3. \_\_\_\_\_ After the war, he sent free dialysis machines to England, Canada, and the United States.
4. \_\_\_\_\_ Dr. Kolff's two life-saving machines are among the most important inventions ever.
5. \_\_\_\_\_ Working with Dr. Robert Jarvik and Dr. Don Olsen, he developed the mechanical heart.

Now write an opinion you could use in your editorial. Then, write two facts that back it up.

1. Opinion: \_\_\_\_\_
2. Fact: \_\_\_\_\_
3. Fact: \_\_\_\_\_

**Now write the first draft of your editorial on a separate sheet of paper. Begin by clearly stating your position. Present the facts and evidence in a logical order. End with your strongest reason.**

### **Revising and Proofreading**

**Read this passage from Gloria’s report. There are eleven errors. Proofread this passage and correct the errors.**

When willem kolff was a young boy growing up in the netherlands he decided he didnt want to be a doctor because doctors have to see people dye every day. However, he did become a doctor, studing at the university of leiden. As a result of his invention of the artificial kidney machine and the artificial heart many people now live longer lifes.

**Now revise and proofread your editorial. Ask yourself:**

- Have I clearly stated why Dr. Kolff should receive a lifetime achievement award?
- Have I supported my arguments or opinions with convincing facts and reasons?
- Have I included evidence from research on the subject?
- Have I presented evidence in logical order?
- Have I shown that I understand the purpose and format of an editorial?
- Have I corrected all grammar errors?
- Have I corrected all errors in spelling, punctuation, and capitalization?

# Human Body Systems

Choose the letter of the best answer.

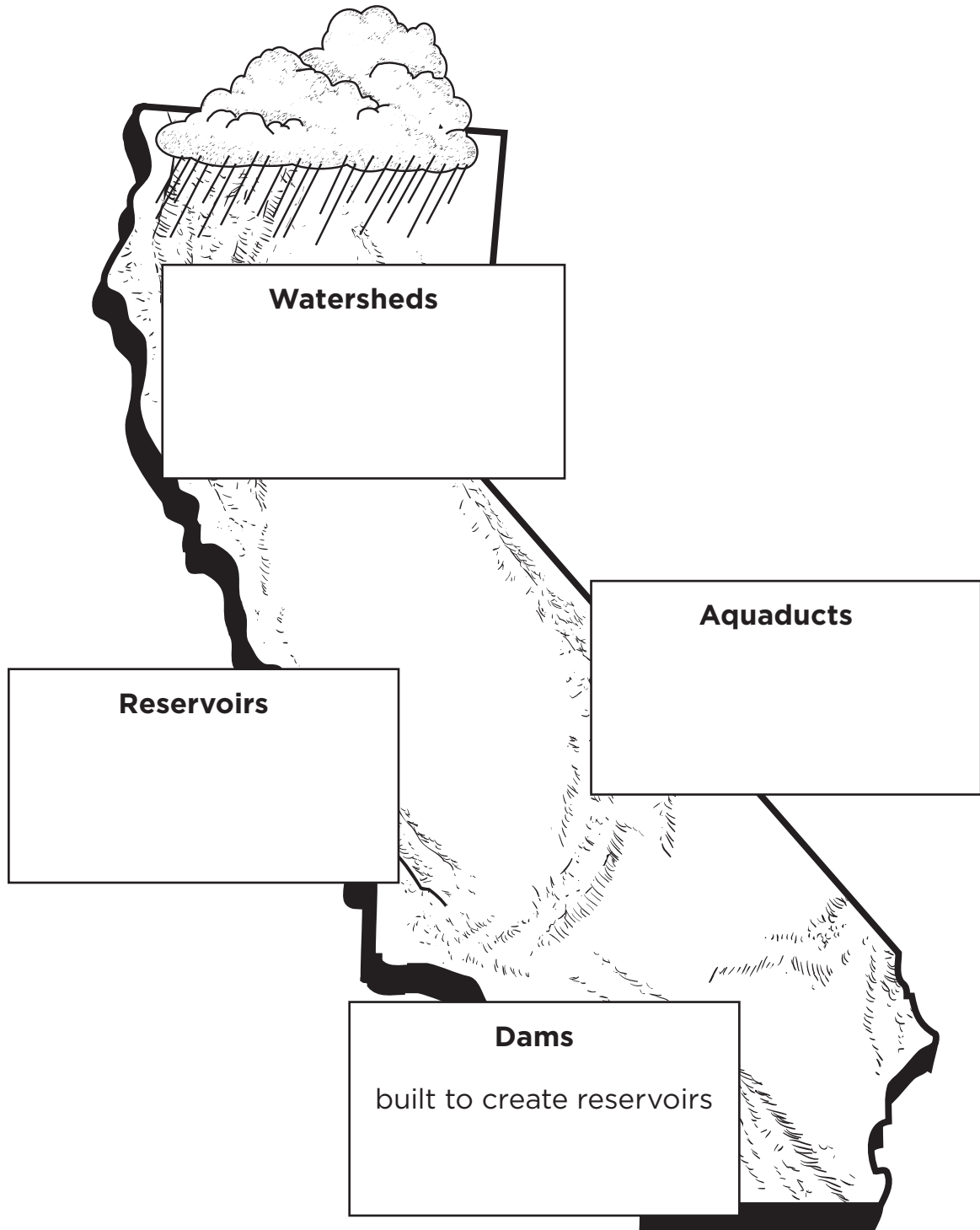
- Your skin and hair are parts of your
  - endocrine system.
  - excretory system.
  - immune system.
  - integumentary system.
- What organ(s) filter waste from the blood?
  - bladder
  - kidneys
  - small intestine
  - urethra
- The body system you use for movement is the
  - muscular system.
  - nervous system.
  - respiratory system.
  - urinary system.
- The system that removes waste from your body is the
  - digestive system.
  - endocrine system.
  - excretory system.
  - integumentary system.
- The system that controls your body's growth and responses is the
  - endocrine system.
  - excretory system.
  - immune system.
  - integumentary system.
- The body system that helps you heal is the
  - circulatory system.
  - immune system.
  - integumentary system.
  - respiratory system.
- Blood cells carrying carbon dioxide return to the heart through
  - arteries.
  - capillaries.
  - veins.
  - lungs.

Choose the letter of the best answer.

8. What is another name for the throat?  
**a.** esophagus    **b.** larynx    **c.** pharynx    **d.** trachea
9. What body system includes the kidneys and bladder?  
**a.** circulatory system    **c.** reproductive system  
**b.** digestive system    **d.** urinary system
10. Oxygen and carbon dioxide move in and out of blood through the walls of the  
**a.** arteries.    **b.** capillaries.    **c.** veins.    **d.** vessels.
11. Food is broken down to supply energy for your body in the  
**a.** digestive system.    **c.** excretory system.  
**b.** endocrine system.    **d.** reproductive system.
12. Flat teeth in the back of your mouth that crush and grind food are  
**a.** canines.    **b.** fangs.    **c.** incisors.    **d.** molars.
13. The muscular organ that pumps blood throughout your body is your  
**a.** diaphragm.    **b.** heart.    **c.** larynx.    **d.** pharynx.
14. Digested food is absorbed in the  
**a.** colon.    **c.** small intestine.  
**b.** large intestine.    **d.** stomach.
15. What system brings in oxygen for your cells to use?  
**a.** reproductive system    **c.** endocrine system  
**b.** digestive system    **d.** respiratory system

# Earth's Water

Complete the concept map with the information you learned about Earth's water.



# Mono Lake

Read the Literature feature in your textbook.



## Write About It

**Response to Literature** The Mono Basin Aqueduct was built to help solve the water crisis in Los Angeles in 1939. Write a personal narrative. Tell about an experience that showed you how important water is to our everyday lives.

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# Earth: The Blue Planet

Use your textbook to help you fill in the blanks.

## How much of Earth's surface is covered by water?

1. A large body of salt water is called a(n) \_\_\_\_\_.
2. About \_\_\_\_\_ of the surface of Earth is covered by oceans.
3. People use different natural \_\_\_\_\_ from the ocean for food, energy, and recreation.

## What makes the ocean salty?

4. As \_\_\_\_\_ runs downhill, it picks up salt from dirt and rocks.
5. Rivers carry this \_\_\_\_\_ into the ocean.
6. \_\_\_\_\_ provides heat that evaporates fresh water from the ocean.
7. \_\_\_\_\_ pound on rocks and sand, and undersea \_\_\_\_\_ erupt, adding salt to the ocean.
8. The concentration of salt in the ocean is about \_\_\_\_\_, which causes ocean water to taste salty.

**Where is Earth's fresh water found on Earth's surface?**

9. Frozen ice sheets contain most of the \_\_\_\_\_ on Earth.
10. Greenland and \_\_\_\_\_ have the only ice sheets in the world.
11. Some fresh water is frozen in \_\_\_\_\_, which are large bodies of ice that move slowly over land.
12. Fresh water flows across Earth's surface in \_\_\_\_\_.
13. Most \_\_\_\_\_ are small to medium-sized bodies of water that are surrounded by land and hold fresh water.

**Summarize the Main Idea**

14. Describe the two kinds of water that cover three-fourths of Earth's surface.

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## Earth: The Blue Planet

**a.** ocean**c.** evaporation**e.** ice sheet**b.** fresh water**d.** water vapor**f.** glacier

Match the correct letter with the description.

1. \_\_\_\_\_ Tiny droplets of water.
2. \_\_\_\_\_ A large body of salt water.
3. \_\_\_\_\_ A slowly moving ice sheet.
4. \_\_\_\_\_ The process of a liquid turning into a gas.
5. \_\_\_\_\_ A huge slab of ice and snow covering a large area of land.
6. \_\_\_\_\_ Water that contains little or no dissolved salts.

## Earth: The Blue Planet

concentration

fresh water

ocean

volcanoes

evaporates

natural resources

salt

### Fill in the blanks.

Oceans cover most of Earth's surface. A(n) \_\_\_\_\_ is a large body of salty water. People use different \_\_\_\_\_ from the ocean for food, energy, and recreation. \_\_\_\_\_ contains little or no dissolved salts and covers only a small fraction of Earth's surface. Rain dissolves \_\_\_\_\_ from soil and rocks, then streams and rivers carry it to the ocean. Heat from sunlight \_\_\_\_\_ ocean water, leaving salt behind. Undersea \_\_\_\_\_ erupt and also add salt to the ocean. Over millions of years, the \_\_\_\_\_ of salt in the ocean has increased to about 3.5 percent. Water with this amount of salt is called salt water.

# The Water Cycle

Use your textbook to help you fill in the blanks.

## What makes water change form?

1. The three forms of water are \_\_\_\_\_ , \_\_\_\_\_ , and \_\_\_\_\_ .
2. When heat is taken away from liquid water, it changes into a(n) \_\_\_\_\_ .
3. Evaporation happens when liquid water turns into a(n) \_\_\_\_\_ .

## What happens to water after it evaporates?

4. Moving air is called a(n) \_\_\_\_\_ or \_\_\_\_\_ .
5. Cold air is more \_\_\_\_\_ than warm air.

## How do clouds form?

6. \_\_\_\_\_ form high in the sky, usually from ice crystals.

**Will it rain?**

- 7. Drops of liquid water in \_\_\_\_\_ are pulled down by their weight.
- 8. If the temperature is \_\_\_\_\_ freezing, drops of water become solid, forming sleet, hail, or snow.
- 9. Snowflakes are formed when water vapor turns directly into solid \_\_\_\_\_ .

**How is water recycled?**

- 10. The \_\_\_\_\_ is the continuous movement of water between Earth’s surface and the air.

**Summarize the Main Idea**

- 11. Describe the three steps that cause water to change during the water cycle.

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# The Water Cycle

**a.** sea breeze**c.** land breeze**e.** precipitation**b.** condensation**d.** fog**f.** water cycle**Match the correct letter with the description.**

1. \_\_\_\_\_ The continuous movement of water between Earth's surface and the air.
2. \_\_\_\_\_ The movement of air from the water to the land.
3. \_\_\_\_\_ The movement of air from the land to the water.
4. \_\_\_\_\_ Water that falls from the air to the ground as rain, sleet, hail, or snow.
5. \_\_\_\_\_ When water changes from vapor to liquid form.
6. \_\_\_\_\_ A cloud that forms near the ground.

# The Water Cycle

condensation

evaporation

precipitation

rises

droplets

hail

rain

temperature

## Fill in the blanks.

Water on Earth is never lost. Water changes from a liquid to a gas during \_\_\_\_\_. Then the water vapor \_\_\_\_\_ in the air. As water vapor moves higher, it turns into tiny water \_\_\_\_\_. This change from gas to liquid is called \_\_\_\_\_. When water droplets get heavy enough, they fall to the ground in the form of \_\_\_\_\_. This can be in liquid form as \_\_\_\_\_, or frozen as snow or \_\_\_\_\_. The type of precipitation depends on the \_\_\_\_\_. When water returns to Earth's surface, the water cycle begins again.



# Freshwater Resources

Use your textbook to help you fill in the blanks.

## Where is Earth's usable fresh water found?

1. Much of Earth's usable freshwater resources are obtained from \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
2. People build \_\_\_\_\_ across rivers to form reservoirs.
3. Layers of rock and soil that allow water to flow through are called \_\_\_\_\_.
4. Some of the fresh water used by people comes from \_\_\_\_\_, or man-made lakes.
5. If people live far away from streams, rivers, and lakes, they can get their water from \_\_\_\_\_.

## What is a watershed?

6. A(n) \_\_\_\_\_ is the name for an area of land from which water \_\_\_\_\_ into a specific river.
7. As \_\_\_\_\_ flows through a watershed, it replaces water that rivers, lakes, and oceans lose through evaporation.
8. \_\_\_\_\_ help control the flow of water through a watershed.
9. A(n) \_\_\_\_\_ occurs when water pours over the banks of a body of water.

**What causes polluted water?**

- 10. \_\_\_\_\_ or polluted water contains substances that can be harmful.
- 11. Governments have passed \_\_\_\_\_ to control water pollution.

**How are freshwater resources cleaned?**

- 12. \_\_\_\_\_ is added to water to kill harmful bacteria.

**Summarize the Main Idea**

- 13. Why is usable fresh water considered a limited resource?

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## Freshwater Resources

- |                       |                     |                       |
|-----------------------|---------------------|-----------------------|
| <b>a.</b> aquifer     | <b>d.</b> flood     | <b>g.</b> watershed   |
| <b>b.</b> contaminate | <b>e.</b> pollute   | <b>h.</b> groundwater |
| <b>c.</b> dam         | <b>f.</b> reservoir |                       |

### Fill in the blanks.

1. \_\_\_\_\_ When water runs over the banks of a body of water.
2. \_\_\_\_\_ An area of land where water drains into a specific body of water.
3. \_\_\_\_\_ To dirty, or pollute, a material such as fresh water.
4. \_\_\_\_\_ A barrier built across a stream or a river.
5. \_\_\_\_\_ A man-made lake that is used to store water.
6. \_\_\_\_\_ Underground layers of rock and soil that absorb water.
7. \_\_\_\_\_ To dirty, or contaminate, a material such as fresh water.
8. \_\_\_\_\_ Source of water reached by drilling or digging wells.

## Freshwater Resources

aquifers

dams

precipitation

chlorine

flood

reservoirs

contaminated

pollution

watersheds

### Fill in the blanks.

Fresh water is a precious resource. People build \_\_\_\_\_ across rivers to create \_\_\_\_\_ of fresh water. Forms of \_\_\_\_\_ such a rain and snow fall onto areas of land that drain into rivers. These areas are called \_\_\_\_\_. Water also flows through underground \_\_\_\_\_. If too much rain comes too fast, water overflows, causing a(n) \_\_\_\_\_.

Fresh water can become \_\_\_\_\_. This makes the water unsafe to use. Water treatment facilities use \_\_\_\_\_ to kill bacteria in drinking water, making it safe. Governments also pass laws to prevent water \_\_\_\_\_. These actions help keep fresh water safe for everyone.

# Water Resources in California

Read the Writing in Science feature in your textbook.



## **Write About It**

**Persuasive** Write a letter to the mayor of your town. Explain a need that the students in your community have and why people should help. State your position clearly and support it with relevant facts and evidence organized in a logical way.

### **Planning and Organizing**

Write three sentences you could use in your letter. The sentences should explain the students' need and persuade people to help.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_

## Drafting

Now use the guidelines below to write your persuasive letter. Use the business-letter format.

1. Write your complete address and the date.
2. Write the name of the person to whom you are writing, the organization, and the address.
3. Write the salutation, or greeting. Put a colon at the end of it.
4. Write the body of the letter. First explain why you are writing and state your position. Then provide facts and evidence that back up your opinion. Finally tell what you want to happen.
5. Write the closing. Use words such as “Sincerely” or “Yours truly.” Put a comma after these words and sign your name.

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

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(3) \_\_\_\_\_

(4) \_\_\_\_\_

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\_\_\_\_\_

(5) \_\_\_\_\_

## California's Water Supply

Use your textbook to help you fill in the blanks.

### Where does California's fresh water come from?

1. Most of California's people live in the \_\_\_\_\_ part of the state.
2. However, most of California's \_\_\_\_\_ falls in the northern part of the state.
3. A(n) \_\_\_\_\_ is a long period of dry weather.
4. Some of the fresh water Californians use comes from water \_\_\_\_\_, or recycled water.
5. \_\_\_\_\_ supply about 30 percent of California's fresh water.

### How is fresh water supplied to Californians?

6. For more than a hundred years, local, state, and federal governments have built different ways to \_\_\_\_\_ and store fresh water in California.
7. People build water channels called \_\_\_\_\_ to move water from place to place.
8. Los Angeles gets water from \_\_\_\_\_ and \_\_\_\_\_.
9. Californians have to make \_\_\_\_\_ about the best uses of their water.

**How can California save water?**

- 10.** Since their water supply is limited, Californians have focused on water \_\_\_\_\_ .
- 11.** Think of water conservation as a way to keep from \_\_\_\_\_ water.
- 12.** Watering lawns uses \_\_\_\_\_ of a household's water.

**Summarize the Main Idea**

- 13.** Where does California's water supply come from?

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## California's Water Supply

- |                        |                       |
|------------------------|-----------------------|
| <b>a.</b> aqueduct     | <b>c.</b> drought     |
| <b>b.</b> conservation | <b>d.</b> reclamation |

Match the correct letter with the description.

1. \_\_\_\_\_ A channel where water travels from place to place.
2. \_\_\_\_\_ A long period of dry weather.
3. \_\_\_\_\_ Preventing the wasting of water.
4. \_\_\_\_\_ Recycling used water.

## California's Water Supply

reclamation

recycle

southern

aqueducts

drought

northern

reservoirs

### Fill in the blanks.

Californians get most of their fresh water from running water, standing water, and underground water. Most of California's rain falls in the \_\_\_\_\_ part of the state, while most people live in the \_\_\_\_\_ part of the state. Dams on rivers form \_\_\_\_\_ of water for people to use. Then water is transported through \_\_\_\_\_ to where people live.

However, the water supply may not be enough, especially during a(n) \_\_\_\_\_. Californians also use water from \_\_\_\_\_ projects. These projects \_\_\_\_\_ water so it can be used again. Californians have learned to conserve water because they cannot afford to waste it.

## Getting the Salt Out

Why does California have water shortages when it is right next to the Pacific Ocean? People cannot drink ocean water because of the salts that are dissolved in it.

The island of Santa Catalina lies off the coast of Southern California. It is completely surrounded by the Pacific Ocean. However, people on the island use water from the ocean all the time — to water crops, to take showers, and even to drink. How can they drink and use the salty ocean water? The water is transformed from salty to fresh at the Santa Catalina desalination plant. Desalination means to take the salt out.

At the desalination plant, ocean water is taken from an ocean water well. Once it is moved into the plant, salt and other impurities are removed from the water. The fresh water that is produced can now be used by people.

The Santa Catalina plant is one of the few desalination plants in the United States that produces water for public use. Desalination is an expensive process that uses a lot of energy. Despite its costs, there are desalination plant projects all over the world, including places like Saudi Arabia and Japan. Desalination is generally used when a community has so little access to fresh water that they are willing to pay a high price to get it. Scientists continue to research cheaper and more efficient ways to produce fresh water from ocean water.



**Problem and Solution**

- Identify the problem by looking for a conflict or an issue that needs to be resolved.
- Think about how the conflict or issue is resolved.



**Write About It**

**Problem and Solution**

1. Why can't the people of Santa Catalina island drink and use water directly from the ocean?

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2. How do the people of Santa Catalina get fresh water?

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## Earth's Water

Choose the letter of the best answer.

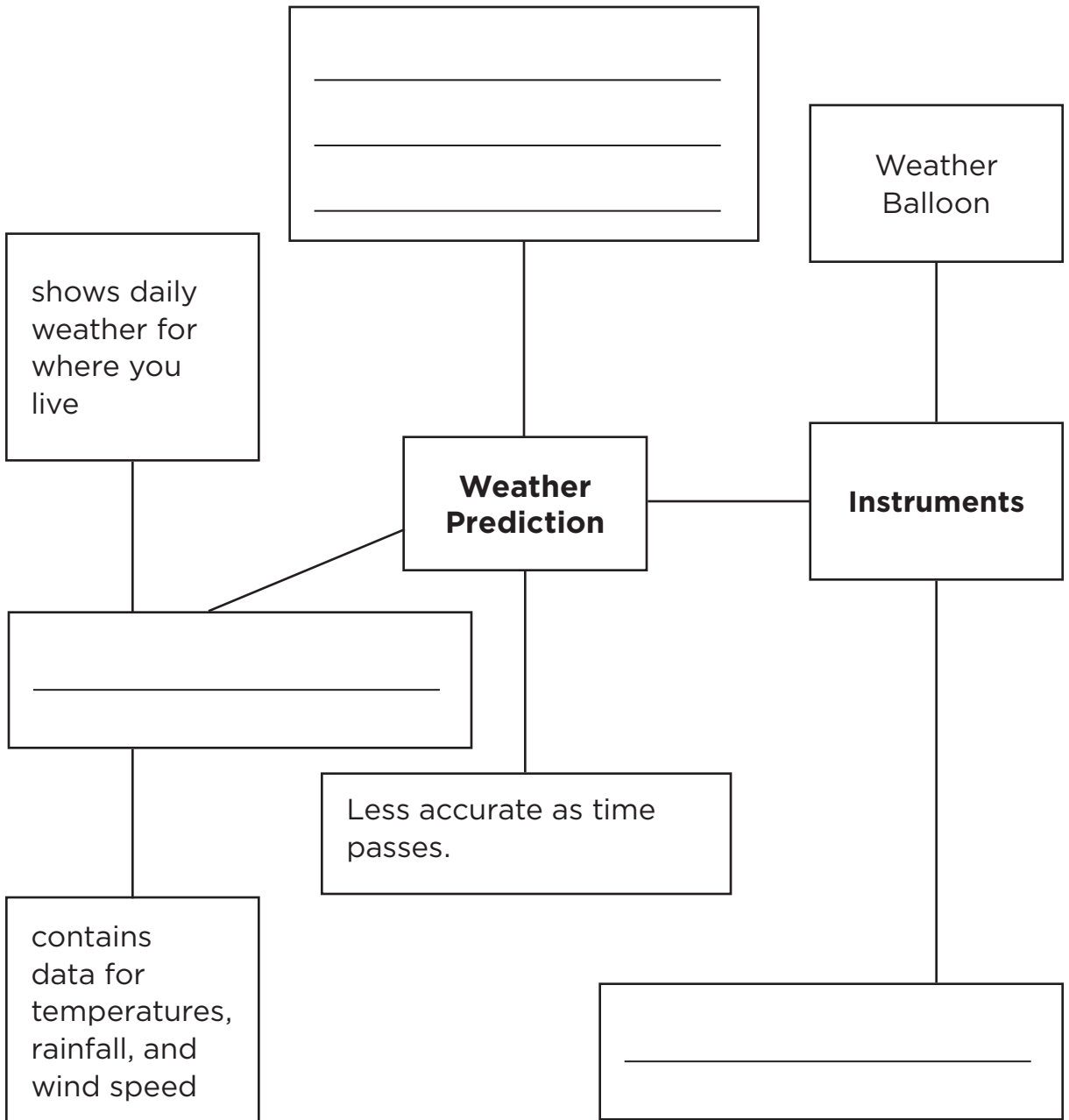
- Layers of rock or soil that allow water to flow through are called
  - aquifers.
  - lakes.
  - reservoirs.
  - watersheds.
- Water that travels across land may pick up substances and become
  - filtered.
  - fresh.
  - polluted.
  - precipitated.
- A sheet of ice that moves slowly over land is a(n)
  - glacier.
  - iceberg.
  - ice cap.
  - ice sheet.
- The continuous movement of water from the Earth's surface to the air and back again is called the
  - water evaporation.
  - water cycle.
  - water sequence.
  - water rotation.
- When water turns into a gas, the water is called
  - condensation.
  - fresh water.
  - steam.
  - water vapor.
- A large body of salty water is called a(n)
  - estuary.
  - lake.
  - ocean.
  - pond.
- A huge slab of ice and snow that covers a very large area of land is called a(n)
  - glacier.
  - iceberg.
  - watershed.
  - blizzard.
- What do we call the area of land that drains into a specific river?
  - rain drain
  - island
  - water drain
  - watershed

Choose the letter of the best answer.

9. A medium-sized body of fresh water surround by land is a(n)  
 a. bay.                      b. lake.                      c. pond.                      d. stream.
10. When water vapor changes to liquid water, it  
 a. condenses.      b. evaporates.      c. freezes.                      d. precipitates.
11. Water that contains little or no dissolved salt is  
 a. filtered water.                                      c. pure water.  
 b. fresh water.                                      d. salt water.
12. Water from a flowing river may build up behind a dam to form a(n)  
 a. ocean.                      b. pond.                      c. reservoir.                      d. stream.
13. A large, flowing body of water is called a  
 a. lake.                      b. stream.                      c. rill.                      d. river.
14. A barrier built across a river is a  
 a. berm.                      b. dam.                      c. dike.                      d. wall.
15. Water that falls from the air to the ground as rain, snow, or sleet is  
 a. condensation.                                      c. evaporation.  
 b. consternation.                                      d. precipitation.
16. To dirty or pollute is to  
 a. contaminate.      b. evaporate.                      c. precipitate.                      d. soil.
17. What kind of water has a salt concentration of about 3.5%?  
 a. filtered water                                      c. pure water  
 b. fresh water                                      d. salt water

# Earth's Weather

Complete the concept map with the information you learned about Earth's weather.



## Strong Storms

Read the Literature feature in your textbook.



### Write About It

**Response to Literature** This article describes the damage caused by severe rainstorms in Los Angeles. Research additional information about damage caused by severe rainstorms. Write a report about the effects of severe rainstorms. Include facts and details from this article and from your research.

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# Earth's Atmosphere

Use your textbook to help you fill in the blanks.

## Why does air take up space?

1. Air is made of a \_\_\_\_\_ such as \_\_\_\_\_ and \_\_\_\_\_ .
2. The force of attraction between an object and Earth is called \_\_\_\_\_ .
3. The layers of gases that form around Earth are called the \_\_\_\_\_ .
4. The layer of gas closest to Earth's surface is called the \_\_\_\_\_ .
5. All of life on Earth exists in the \_\_\_\_\_ .
6. Weather occurs in the \_\_\_\_\_ because of water vapor.
7. The force put on a given area by the weight of the air above it is called \_\_\_\_\_ .

## What variables can change air pressure?

8. Factors that affect air pressure are height, \_\_\_\_\_ , \_\_\_\_\_ , and \_\_\_\_\_ .
9. Air pressure is lower at the top of a mountain than at sea level because \_\_\_\_\_ above a mountain is shorter than \_\_\_\_\_ above sea level.
10. A measure of height above Earth's surface is called \_\_\_\_\_ .

11. How much space something takes up is called \_\_\_\_\_ .
12. When a sealed bag is compressed, more space is available in the bag, but the air pressure \_\_\_\_\_ .
13. When air is heated, the gases speed up and \_\_\_\_\_ .
14. When air is heated and fewer gases are in it, the air weighs \_\_\_\_\_ and the pressure \_\_\_\_\_ .
15. Dry air exerts \_\_\_\_\_ pressure than air that has \_\_\_\_\_ .
16. Water vapor weighs \_\_\_\_\_ than most of the gases in air.

**How can atmospheric pressure be measured?**

17. An instrument used to measure atmospheric pressure is called a(n) \_\_\_\_\_ .
18. Scientists use two different kinds of barometers: \_\_\_\_\_ and \_\_\_\_\_ .
19. Pilots use barometers to tell the \_\_\_\_\_ of their plane.

**Summarize the Main Idea**

20. How does air affect Earth's atmosphere?

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## Earth's Atmosphere

**a.** air pressure**d.** barometer**g.** troposphere**b.** altitude**e.** gravity**h.** volume**c.** atmosphere**f.** temperature**i.** water vapor

Match the correct letter with the description.

1. \_\_\_\_\_ An instrument used to measure air pressure.
2. \_\_\_\_\_ Layers of gases that form around Earth.
3. \_\_\_\_\_ The force of attraction between an object and Earth.
4. \_\_\_\_\_ A measure of height above Earth's surface.
5. \_\_\_\_\_ The layer of gas closest to Earth.
6. \_\_\_\_\_ The force put on a given area by the weight of the air above it.

Choose three words from the word box above that complete the sentence.

**7-9.** Variables that can change air pressure are height,

\_\_\_\_\_, \_\_\_\_\_, and  
\_\_\_\_\_.

## Earth's Atmosphere

air pressure	gases	troposphere	volume
altitude	mercury	temperature	water vapor
aneroid	nitrogen	all life on Earth	
Earth	oxygen		

### Fill in the blanks.

Air has weight, takes up space, and exerts pressure. Air is made up of a mixture of gases that includes \_\_\_\_\_ and \_\_\_\_\_ . Gravity attracts \_\_\_\_\_ in the air and forms layers around \_\_\_\_\_ . The layer of gases closest to Earth's surface is called the \_\_\_\_\_ . This layer is where \_\_\_\_\_ exists and where \_\_\_\_\_ is found. When the gravity of Earth gives these gases weight, it causes the gases to push against other objects. This weight of air is called \_\_\_\_\_ or atmospheric pressure. Air pressure can change because of four variables: \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ , and the amount of water vapor. Two instruments used to measure atmospheric pressure are the \_\_\_\_\_ and the \_\_\_\_\_ barometers. These barometers are useful tools for weather forecasters to measure atmospheric pressure and for pilots to measure altitude.

## Air Currents and Wind

Use your textbook to help you fill in the blanks.

### Why are temperatures different around the world?

1. The Sun heats Earth's atmosphere and surface \_\_\_\_\_ .
2. That is because the shape of Earth looks like a \_\_\_\_\_ or ball.
3. Sunlight strikes Earth in a circle at \_\_\_\_\_ .
4. Sunlight strikes Earth above or below the equator in the shape of a(n) \_\_\_\_\_ .
5. Areas farther north or south of the equator receive \_\_\_\_\_ from sunlight.
6. Areas closer to the equator receive \_\_\_\_\_ and \_\_\_\_\_ .

### What makes air move?

7. Air moves from where the pressure is \_\_\_\_\_ to where the pressure is \_\_\_\_\_ .
8. During the day, \_\_\_\_\_ heats up faster than \_\_\_\_\_ .
9. When air moves from land to water, it is called a(n) \_\_\_\_\_ .
10. When air moves from water toward land, it is called a(n) \_\_\_\_\_ .

- 11.** Land and water temperature changes cause differences in \_\_\_\_\_ .
- 12.** The flow of air in a loop caused by differences in temperature and pressure is called a(n) \_\_\_\_\_ .

**How are winds that flow around the world produced?**

- 13.** When ships sailed from Europe to the Americas, they took advantage of winds that blew from \_\_\_\_\_ to \_\_\_\_\_ .
- 14.** Captains learned that these winds were found in bands between the \_\_\_\_\_ and \_\_\_\_\_ .
- 15.** Winds between 30°N latitude and 30°S latitude became known as \_\_\_\_\_ .
- 16.** Latitude is a measure of how far \_\_\_\_\_ or \_\_\_\_\_ a place is from the equator.
- 17.** Trade winds are part of a system of winds called \_\_\_\_\_ .
- 18.** Air does not move straight north or south because of \_\_\_\_\_ .

**Summarize the Main Idea**

- 19.** How do the shape and rotation of Earth cause uneven heating?

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## Air Currents and Wind

- |                              |                        |                       |
|------------------------------|------------------------|-----------------------|
| <b>a.</b> air pressure       | <b>d.</b> global winds | <b>g.</b> sea breeze  |
| <b>b.</b> convection current | <b>e.</b> land breeze  | <b>h.</b> sphere      |
| <b>c.</b> equator            | <b>f.</b> latitude     | <b>i.</b> trade winds |

Match the correct letter with the description.

- \_\_\_\_\_ Winds that cover the world.
- \_\_\_\_\_ Winds between 30°N latitude and 30°S latitude.
- \_\_\_\_\_ Cool air that moves from land to water.
- \_\_\_\_\_ Flow of air in a loop.
- \_\_\_\_\_ A three-dimensional shape that looks like a ball.
- \_\_\_\_\_ The force put on a given area by the weight of the air above it.
- \_\_\_\_\_ A measure used north or south of the equator.
- \_\_\_\_\_ Air that moves over water toward land.
- \_\_\_\_\_ An imaginary line that runs around Earth's middle.

## Air Currents and Wind

at the equator

higher

lower

convection current

in curved paths

differences in air pressure

less heat from sunlight

### Fill in the blanks.

The Sun warms the surface of Earth and the air above it. Sunlight strikes Earth most directly \_\_\_\_\_. Because Earth's surface is curved, the surface north or south of the equator receives \_\_\_\_\_. Throughout the day, land and water temperature change causing \_\_\_\_\_. Air moves from where pressure is \_\_\_\_\_ to where the pressure is \_\_\_\_\_. The flow of air in a loop caused by differences in temperature and pressure is called a(n) \_\_\_\_\_. It takes the form of a wind or a breeze. Winds move around the world \_\_\_\_\_, not straight north or south. These global winds are predictable, blow steadily, and blow over long distances.



## Oceans and Air Temperature

Use your textbook to help you fill in the blanks.

### How do oceans affect temperature on land?

1. In the summer, the air temperature over the \_\_\_\_\_ does not change significantly, while the air temperature over \_\_\_\_\_ warms very rapidly.
2. In the winter, the air temperature over the \_\_\_\_\_ will be warmer than the air temperature over the \_\_\_\_\_.
3. The average weather conditions of a place or region throughout the year is called its \_\_\_\_\_.
4. In addition to average temperatures and average rainfall, climate includes \_\_\_\_\_ and \_\_\_\_\_.

### How do the oceans move heat from one place to another?

5. An ongoing movement of ocean water is called a(n) \_\_\_\_\_.
6. Two examples of ocean currents are the \_\_\_\_\_ and the \_\_\_\_\_.
7. Currents affect the \_\_\_\_\_ and the \_\_\_\_\_ of the land in their paths.
8. Weather in the form of rain, snow, hail, or sleet is called \_\_\_\_\_.

9. When water takes in heat, it \_\_\_\_\_ .
10. The opposite of evaporation is \_\_\_\_\_ .
11. Because condensation releases heat, the land under the air gets \_\_\_\_\_ .
12. A cold ocean current means less \_\_\_\_\_ in the air and less \_\_\_\_\_ .

**How does ocean temperature affect weather?**

13. Winds off the coast of South America near the equator normally blow \_\_\_\_\_ .
14. An abnormal, warmer current of water off the coast of Peru that happens every 2-7 years is called \_\_\_\_\_ .
15. ENSO is an acronym for \_\_\_\_\_ .
16. Another word for a movement back and forth is called \_\_\_\_\_ .
17. During an El Niño, winds drag ocean water causing \_\_\_\_\_ , \_\_\_\_\_ , and \_\_\_\_\_ along the west coasts of North and South America.

**Summarize the Main Idea**

18. What determines the weather conditions and climate of land?

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## Oceans and Air Temperature

- |                        |                            |                         |
|------------------------|----------------------------|-------------------------|
| <b>a.</b> climate      | <b>d.</b> Labrador Current | <b>g.</b> humidity      |
| <b>b.</b> condensation | <b>e.</b> ENSO             | <b>h.</b> oscillation   |
| <b>c.</b> current      | <b>f.</b> evaporation      | <b>i.</b> precipitation |

Match the correct letter with the description.

- \_\_\_\_\_ Current of water moving from the North Pole toward the equator.
- \_\_\_\_\_ Weather in the form of rain, snow, sleet, or hail.
- \_\_\_\_\_ An acronym for El Niño/Southern Oscillation.
- \_\_\_\_\_ The process of water releasing heat.
- \_\_\_\_\_ A movement back and forth.
- \_\_\_\_\_ The average weather conditions of a region throughout the year.
- \_\_\_\_\_ The process of changing water into vapor or gas.
- \_\_\_\_\_ Moisture in the air.
- \_\_\_\_\_ An ongoing movement of ocean water.

## Oceans and Air Temperature

currents

Labrador Current

oceans

El Niño

loses heat

precipitation

Gulf Stream

moderate

### Fill in the blanks.

The ocean water influences weather and weather patterns of nearby land. Water absorbs heat more slowly than land does; it also \_\_\_\_\_ more slowly than land does. Oceans keep temperatures \_\_\_\_\_. Differences between temperatures near the equator and temperatures near the poles would be much greater if Earth had no \_\_\_\_\_. Oceans move heat from one place to another by \_\_\_\_\_. One ocean current that circulates warm water along the Atlantic coast is the \_\_\_\_\_. A cold ocean current along the eastern coast of Canada is the \_\_\_\_\_. Ocean currents affect the amount of \_\_\_\_\_, or rain and snow, in an area. \_\_\_\_\_ in the Pacific Ocean is a good example of the way that ocean temperature affects weather. As a result of El Niño, California experienced heavy rains and storms, and Australia and Southwest Asia experienced very dry weather conditions in 1997–1998.

# Severe Weather

Use your textbook to help you fill in the blanks.

## What causes severe weather?

1. A large region of air that has a similar temperature and amount of moisture is called a(n) \_\_\_\_\_.
2. Changes in weather occur when one air mass meets \_\_\_\_\_.
3. The boundary marking the edge of the oncoming air mass is called a(n) \_\_\_\_\_.
4. A cold front brings \_\_\_\_\_ and \_\_\_\_\_ air, while a warm front usually brings warm air and \_\_\_\_\_.

## What causes thunderstorms?

5. The spark caused when the electricity in a thunderhead discharges is called \_\_\_\_\_.
6. The sound of thunder is caused by the heat of a lightning bolt making the air \_\_\_\_\_ violently.

## What causes tornadoes?

7. When warm air moves upward in a thunderhead, it creates a zone of \_\_\_\_\_.
8. When an area of low pressure air is surrounded by high pressure air, it is called a(n) \_\_\_\_\_.
9. When the tip of the funnel cloud touches the ground, it becomes a(n) \_\_\_\_\_.

- 10.** The area with the worst and most frequent tornadoes is known as \_\_\_\_\_ .
- 11.** Ideal weather conditions for tornadoes are in places where cold, dry air from \_\_\_\_\_ meets warm, moist air from \_\_\_\_\_ .

**What are hurricanes?**

- 12.** A large, swirling storm with low pressure at its center is called a(n) \_\_\_\_\_ .
- 13.** In the northern hemisphere, the air in a hurricane spins \_\_\_\_\_ .
- 14.** The rotation of hurricanes is related to the \_\_\_\_\_ .
- 15.** From space, a hurricane looks like a spiral of clouds with a hole in its middle, also known as the \_\_\_\_\_ .
- 16.** Hurricanes create huge waves and a bulge of water in the ocean called a(n) \_\_\_\_\_ .
- 17.** Both \_\_\_\_\_ and \_\_\_\_\_ are types of cyclones because they are storms with a low pressure closure that make \_\_\_\_\_ .

**Summarize the Main Idea**

- 18.** What causes unsettled weather and storms to brew?

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## Severe Weather

- |                    |                                |                       |                        |
|--------------------|--------------------------------|-----------------------|------------------------|
| <b>a.</b> air mass | <b>d.</b> front                | <b>g.</b> monsoon     | <b>i.</b> thunderstorm |
| <b>b.</b> cyclone  | <b>e.</b> hurricane            | <b>h.</b> storm surge | <b>j.</b> tornado      |
| <b>c.</b> drought  | <b>f.</b> low pressure closure |                       |                        |

Match the correct letter with the description.

- \_\_\_\_\_ A long period without rain, or very little rain.
- \_\_\_\_\_ A funnel-shaped low pressure closure.
- \_\_\_\_\_ The boundary that marks air masses with different temperatures and moisture.
- \_\_\_\_\_ Any storm with a circular wind pattern and a low pressure closure.
- \_\_\_\_\_ A rainstorm that produces lightning and thunder.
- \_\_\_\_\_ A large region of air that has a similar temperature and amount of moisture.
- \_\_\_\_\_ A large swirling storm with low pressure in its center and wind gusts of more than 75 miles per hour.
- \_\_\_\_\_ A storm with heavy rains that may cause flooding, mudslides, or landslides.
- \_\_\_\_\_ A bulge of water created by large waves in the ocean.
- \_\_\_\_\_ An area of low pressure that is surrounded by higher air pressure.

## Severe Weather

cold	fronts	thunderstorms
drought	hurricanes	tornadoes
eye	monsoon	warm

### Fill in the blanks.

Storms and severe weather occur when air masses collide. Air masses can be \_\_\_\_\_ and moist, or \_\_\_\_\_ and dry. Unsettled weather and storms form at the boundaries of air masses called \_\_\_\_\_. Rainstorms with thunder and lightning are called \_\_\_\_\_. Given the right weather conditions, thunderstorms can turn into \_\_\_\_\_. Thunderstorms with wind speeds over 75 miles per hour can turn into \_\_\_\_\_ over the Atlantic Ocean. The fastest winds and heaviest rains are near the center of the storm called the \_\_\_\_\_ of the hurricane. Another type of severe weather that can bring heavy rains with flooding and mudslides is called a(n) \_\_\_\_\_. The opposite of too much rain is too little or no rain, which causes a(n) \_\_\_\_\_. Even fog can cause severe weather, especially when it interferes with safety at airports and on highways.



# Severe Weather

Read the Writing in Science feature in your textbook.



## Write About It

**Narrative Writing** Write a personal narrative about a storm, mudslide, or other severe weather condition that you have experienced. Use a clear sequence of events to tell what happened and what you did.

## Planning and Organizing

Chronological order, or time order, is the order in which events occur from first to last. It's a good way to organize a personal narrative. Help Cody organize her narrative. Number her sentences to show time order. Write 1 by the sentence that should come first, 2 by the sentence that should come next, and so on. The last sentence should be numbered 4.

1. Next the clouds seemed to open and heavy snow began falling. \_\_\_\_\_
2. The blowing snow combined with the falling snow to create a ferocious storm. \_\_\_\_\_
3. Then, the sky began to darken as heavy clouds formed. \_\_\_\_\_
4. At first, it seemed a beautiful day on the mountain. \_\_\_\_\_

Now write five sentences you could use in your own personal narrative. Arrange them in chronological order.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Now write your first draft on a separate sheet of paper. Tell the events in chronological order. Use the details to describe the setting and bring the events alive for the reader. End with a satisfying conclusion.

**Revising and Proofreading**

Here are sentences from Cody's personal narrative. She used too many short, choppy sentences. Combine them to make her writing stronger.

1. During a blizzard, there are high winds. There is also driving snow.

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2. Often, you can't see anything for up to a quarter of a mile. This condition can last for over three hours.

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3. The sky began to darken. The winds began to blow. It all happened suddenly.

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Now revise and proofread your own narrative. Ask yourself:

- Have I used the "I" point of view throughout?
- Have I used adjectives or verbs that make my description of the setting vivid?
- Have I organized my sentences in time order?
- Have I combined any short, choppy sentences?
- Have I corrected any grammar problems?
- Have I corrected any spelling, capitalization, and punctuation problems?

# Predicting the Weather

Use your textbook to help you fill in the blanks.

## Who needs to know what the weather will be?

1. To \_\_\_\_\_ is to make your best prediction before the event happens.
2. Variables such as \_\_\_\_\_ and \_\_\_\_\_ help weather forecasters improve the accuracy of their predictions.
3. A meteorologist is a scientist who specializes in the study of Earth's \_\_\_\_\_ and \_\_\_\_\_.

## Why do meteorologists use weather maps?

4. A weather map shows the weather in a specific \_\_\_\_\_ at a specific \_\_\_\_\_.
5. \_\_\_\_\_ on a weather map may show you wind speed, cloud cover, air temperature, and precipitation for a specific area.

## What do highs and lows tell you?

6. Winds in a low-pressure system turn in a \_\_\_\_\_ direction in the northern hemisphere.
7. A high-pressure system is a large mass of air with the highest air pressure in the \_\_\_\_\_, with winds blowing \_\_\_\_\_ from the center.
8. High-pressure winds also turn to the \_\_\_\_\_ because of the rotation of Earth.

9. Wind in a high-pressure system turns in a \_\_\_\_\_ direction.
10. Low-pressure systems usually bring \_\_\_\_\_ and \_\_\_\_\_ weather.
11. Moisture held in a low pressure air mass \_\_\_\_\_ and cools as it rises bringing precipitation.

**What do weather fronts tell you?**

12. Warm and cold fronts are the leading edges of \_\_\_\_\_ and can tell you what the weather is going to be like in the \_\_\_\_\_ .
13. Jet stream winds can reach speeds of \_\_\_\_\_ kilometers, or \_\_\_\_\_ miles per hour and higher.
14. Jet streams blow from \_\_\_\_\_ to \_\_\_\_\_ , so almost all weather fronts in North America move in the same direction.

**How do weather forecasters collect data?**

15. Meteorologists use \_\_\_\_\_ on Earth's surface, in the sky, and in space to forecast the weather.

**Summarize the Main Idea**

16. Briefly explain why weather maps are important and what resources are used to forecast the weather.

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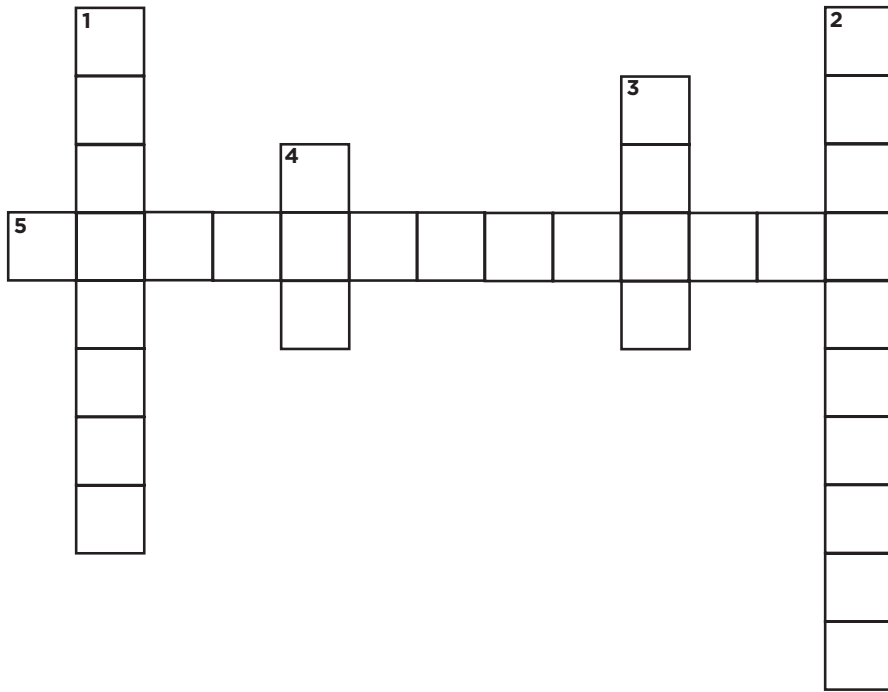
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# Predicting the Weather

Use the clues below to help you fill in the crossword puzzle.



- forecast
- high
- low
- meteorologist
- weather map

**Across**

- 5.** A scientist who specializes in the study of Earth’s atmosphere and weather.

**Down**

- 1.** To make your best prediction before the event happens.
- 2.** This item shows the weather in a specific area at a specific point in time.
- 3.** Air pressure where the air moves in a clockwise direction.
- 4.** Air pressure where the air moves in a counterclockwise direction.

## Predicting the Weather

forecasts

reliable

space

weather maps

pilots

sky

surface

### Fill in the blanks.

Meteorologists do not use crystal balls to predict the weather's future. Instead, they make \_\_\_\_\_ using instruments on Earth's \_\_\_\_\_, in the \_\_\_\_\_, and in \_\_\_\_\_ to gather data about changes in Earth's atmosphere. Weather forecasts help \_\_\_\_\_ take off and land their planes safely. Most 12- to 24-hour forecasts are more \_\_\_\_\_ than long-term forecasts. \_\_\_\_\_ show the weather in a specific area at a specific point in time. Weather fronts lead air masses such as high- and low-pressure systems and help meteorologists predict the weather.

## Museum Mail Call

Scientists at the American Museum of Natural History study the natural world and the people who live in it. They collect stories and objects from people around the world. Read these letters to find out how weather affects children in different countries at the same time of the year.

June 13

Dear Museum Scientists,

Hola! (That’s “hello” in Spanish.) It’s the dry season here in Palmdale right now and it’s muy caliente — very hot! We haven’t had rain in weeks.

It’s usually hot and dry here from May to November. We don’t have a lot of water, so it has to be piped in from other areas. People have to watch how much water they use. Restaurants only serve water to people who ask for it.

Some people plant cacti and shrubs around their home. These plants need a lot less water than a thick, green lawn. I planted jalapeño peppers with mi hermana, my sister. We water the plants in the evening. That way the hot sun won’t dry up all of the water.

*Carlos*

June 23

Dear Museum Scientists,

The gío móa, or monsoons, have brought wet weather to our land. Everything here is soaked! Our monsoon season lasts from May to October. Many inches of rain can fall during heavy storms. But the storms only last for about an hour each day. It’s very hot, so we don’t mind getting wet. It’s actually a lot of fun, and we dry off right away.

Our farm is near the Mekong River. Water floods our rice fields and helps the rice grow. It’s hard work walking through the swampy ground. We carry the rice with quang ganh. These are baskets that we balance on the end of a pole.

People here are used to a lot of water. We build our homes on stilts so the water won’t get in. We ride boats down the river and sell our rice on a floating market. Some years, there is more water than we expect!

*Vang*

**Compare and Contrast**

- To compare, look for similarities, or things that are the same.
- To contrast, look for differences, or things that are not the same.

**Write About It**  
**Compare and Contrast**

1. How is the weather in Palmdale compared to the weather near the MeKong River?

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2. What activity do both Carlos and Vang do?

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# Earth's Weather

Choose the letter of the best answer.

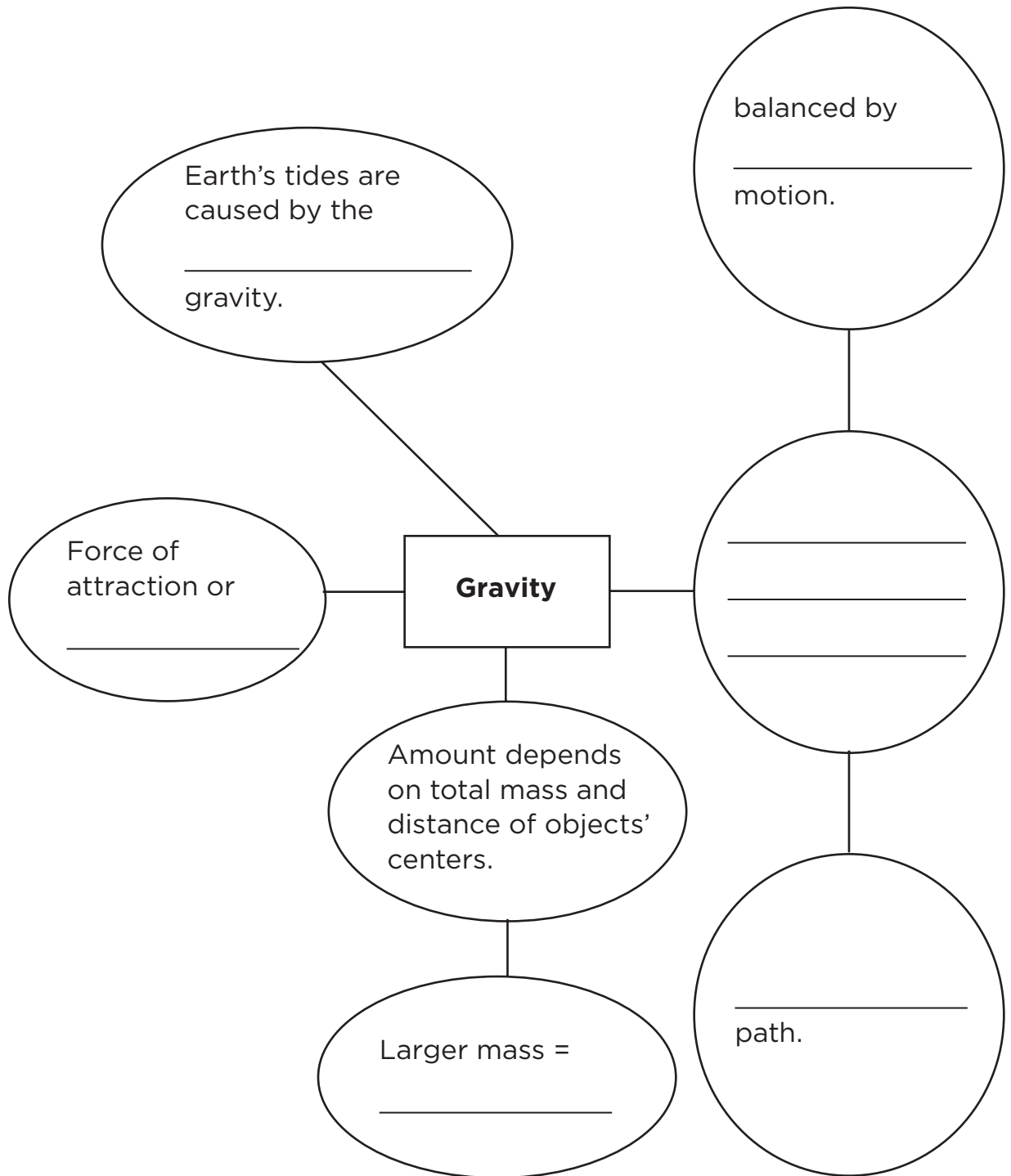
1. A rotating funnel-shaped cloud is a(n)  
**a.** dust devil    **b.** hurricane    **c.** tornado    **d.** water spout
2. A long period with little or no rain is a(n)  
**a.** cyclone    **b.** drought    **c.** heat wave    **d.** monsoon
3. What instrument is used to measure atmospheric pressure?  
**a.** anemometer    **b.** barometer    **c.** psychrometer    **d.** wind vane
4. A large region of air with a similar temperature and amount of moisture is a(n)  
**a.** air mass    **b.** air pressure    **c.** atmosphere    **d.** front
5. Winds which blow in bands between 30°N latitude and 30°S latitude are the  
**a.** banded winds    **c.** trade winds  
**b.** east winds    **d.** west winds
6. An ongoing movement of ocean water is a(n)  
**a.** current    **b.** swell    **c.** tide    **d.** wave
7. Intense seasonal winds that can bring a lot of rain are  
**a.** cyclones    **c.** monsoons  
**b.** hurricanes    **d.** thunderstorms
8. Layers of gases around Earth make up the  
**a.** atmosphere    **c.** stratosphere  
**b.** climate    **d.** troposphere

**Choose the letter of the best answer.**

- 9.** A storm with a low-pressure closure that forms a circular wind pattern is a(n)  
**a.** current      **b.** cyclone      **c.** monsoon      **d.** thunderstorm
- 10.** What contains data that is used to predict weather?  
**a.** barometer      **b.** meteorologist      **c.** front      **d.** weather map
- 11.** What is the force put on a given area by the air above?  
**a.** air pressure      **b.** atmosphere      **c.** trade wind      **d.** troposphere
- 12.** The boundary between air masses with different temperatures and pressures is called a(n)  
**a.** atmosphere      **c.** forecast  
**b.** convection current      **d.** front
- 13.** What do we call the average weather conditions of a place throughout the year?  
**a.** average weather      **c.** current  
**b.** climate      **d.** meteorology
- 14.** A large, swirling storm that forms over the Atlantic Ocean is a(n)  
**a.** convection current      **c.** hurricane  
**b.** thunderstorm      **d.** tornado
- 15.** A weather prediction before it happens is a(n)  
**a.** forecast      **b.** guess      **c.** hypothesis      **d.** meteorologist
- 16.** What do we call a measure of height above Earth's surface?  
**a.** altitude      **b.** attitude      **c.** latitude      **d.** longitude

# The Solar System

Complete the concept map with the information you learned about the Solar System.



# Stopping By a Planet on a Snowy Evening

Read the Literature feature in your textbook.



## Write About It

**Response to Literature** The space traveler in this poem cannot tell where he or she is. Write a fictional narrative as if you were the space traveler in this poem and were landing on this planet.

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# The Sun

Use your textbook to help you fill in the blanks.

## What is the Sun?

1. A \_\_\_\_\_ is an object that produces its own light energy.
2. If the Sun were a hollow ball, more than a \_\_\_\_\_ Earths could fit in it.
3. The mass of the Sun can be calculated if we know the \_\_\_\_\_ it takes a planet to make one trip around the Sun and the \_\_\_\_\_ between the planet and the Sun.

## What are the parts of the Sun?

4. The Sun is made up of two very light gases, \_\_\_\_\_ and helium.
5. A \_\_\_\_\_ is a burst of heat and energy that stretches from the surface of the Sun into space.
6. Dark spots that appear on the surface of the Sun are called \_\_\_\_\_.

## How does the Sun produce energy?

7. Einstein's equation for mass and energy is \_\_\_\_\_.
8. Einstein's equation tells us that a little bit of mass can be changed into a lot of \_\_\_\_\_.
9. The smashing together of atoms is called \_\_\_\_\_.

**What are asteroids and comets?**

10. A(n) \_\_\_\_\_ is a rock that revolves around the Sun.
11. A(n) \_\_\_\_\_ is a mixture of ice, dust, and rock that circles the Sun.
12. The glowing ball of gases and dust that form around a comet is called a \_\_\_\_\_ .
13. The Sun's \_\_\_\_\_ shapes the comet into a shimmering tail that can stretch out millions of kilometers.

**What are meteoroids, meteors, and meteorites?**

14. Particles outside Earth's atmosphere are called \_\_\_\_\_ .
15. The particles that enter Earth's atmosphere are called \_\_\_\_\_ .
16. When a meteor reaches Earth's surface, it is called a(n) \_\_\_\_\_ .

**Summarize the Main Idea**

17. How does Einstein's theory,  $E = mc^2$ , explain the relationship between energy and mass?

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# The Sun

- |                    |                      |                       |                    |
|--------------------|----------------------|-----------------------|--------------------|
| <b>a.</b> asteroid | <b>d.</b> fusion     | <b>g.</b> meteors     | <b>j.</b> sunspots |
| <b>b.</b> comet    | <b>e.</b> meteorites | <b>h.</b> solar flare |                    |
| <b>c.</b> Einstein | <b>f.</b> meteoroids | <b>i.</b> star        |                    |

## Match the correct letter with the description

- \_\_\_\_\_ Burst of heat and energy that stretches from the surface of the Sun into space.
- \_\_\_\_\_ A rock that revolves around the Sun.
- \_\_\_\_\_ Scientist that discovered an equation between energy and mass.
- \_\_\_\_\_ Particles in Earth's atmosphere that streak through the sky.
- \_\_\_\_\_ Dark spots that appear occasionally on the surface of the Sun.
- \_\_\_\_\_ The smashing together of atoms.
- \_\_\_\_\_ A mixture of ice, dust, and rock that circles around the Sun.
- \_\_\_\_\_ Particles outside of Earth's atmosphere.
- \_\_\_\_\_ An object that produces its own heat and light energy.
- \_\_\_\_\_ Shooting stars that reach Earth's surface.

## The Sun

asteroid	$E = mc^2$	heat	light
aurora borealis	energy	helium	mass
comet	fusion	hydrogen	

### Fill in the blanks.

The Sun is the largest object in the solar system. The Sun is a star, meaning that it produces its own \_\_\_\_\_ and \_\_\_\_\_ energy. It is a large sphere made up of mostly two gases, \_\_\_\_\_ and \_\_\_\_\_. Solar flares release energy into space that produces lights in Earth's sky called \_\_\_\_\_. Einstein discovered the equation to show the relationship between energy and \_\_\_\_\_. The equation \_\_\_\_\_ tells us that a little bit of mass can be changed into a lot of \_\_\_\_\_. Inside the Sun, hydrogen atoms smash together causing \_\_\_\_\_. This makes the larger atom, helium. An \_\_\_\_\_ is a rock that revolves around the sun. A \_\_\_\_\_ is a mixture of ice, dust, and rock that circles the Sun. The Sun is an amazing star!



# The Structure of the Solar System

Use your textbook to help you fill in the blanks.

## How is the solar system organized?

1. The \_\_\_\_\_ is a system of objects around the Sun.
2. The first four planets nearest to the Sun, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ have rocky surfaces.
3. The next four planets are called \_\_\_\_\_.

## How do we learn about the solar system?

4. A \_\_\_\_\_ is a device that uses lenses to focus light in a certain way so distant objects can be seen.
5. Scientists on Earth build telescopes on top of \_\_\_\_\_ so the atmosphere doesn't interfere with what they can see.
6. \_\_\_\_\_ have walked on Earth's Moon.

## What are the moons of the solar system?

7. A moon is an object that \_\_\_\_\_ another planet.
8. A moon is also called a \_\_\_\_\_.
9. When objects in space collide, the impact forms a \_\_\_\_\_ or hole.

10. The rock on the surface of the Moon is \_\_\_\_\_ than the rock underneath.
11. Earth's \_\_\_\_\_ burns up most objects before they can land on Earth's surface.
12. There is no \_\_\_\_\_ or water on the Moon to wear away the edges of the craters.

**Summarize the Main Idea**

13. Why can we see the craters of the Moon so clearly from Earth?

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## The Structure of the Solar System

- |                                 |                     |                        |
|---------------------------------|---------------------|------------------------|
| <b>a.</b> artificial satellites | <b>d.</b> Earth     | <b>g.</b> solar        |
| <b>b.</b> astronauts            | <b>e.</b> Galileo   | <b>h.</b> solar system |
| <b>c.</b> crater                | <b>f.</b> satellite | <b>i.</b> telescope    |

1. \_\_\_\_\_ the system of objects around the Sun
2. \_\_\_\_\_ the only planet that can support life
3. \_\_\_\_\_ the scientist who discovered moons circling around Jupiter
4. \_\_\_\_\_ people who travel in a spacecraft
5. \_\_\_\_\_ a hole formed when two objects in space collide
6. \_\_\_\_\_ means “of the sun”
7. \_\_\_\_\_ a device that uses lenses to focus light so distant objects can be seen
8. \_\_\_\_\_ a man-made object that circles Earth and provides weather information and is part of a communication system
9. \_\_\_\_\_ any object in space that circles another object

## The Structure of the Solar System

9	hydrogen	solar
140	moon	telescope
Earth	revolve	rocky

### Fill in the blanks.

The Sun is the center of our solar system. The word \_\_\_\_\_ means “of the Sun.” Our solar system includes \_\_\_\_\_ planets and \_\_\_\_\_ moons. The first four planets have \_\_\_\_\_ surfaces. The next four planets are called gas giants because they are mostly made up of \_\_\_\_\_ and helium gases. \_\_\_\_\_ is the only planet that can support life. In 1610, Galileo used a \_\_\_\_\_ to discover moons circling around Jupiter. Galileo’s theory showed that everything in the solar system did not \_\_\_\_\_ around the Earth but the Sun instead. A \_\_\_\_\_ is an object that circles around a planet. Jupiter has at least sixty-three moons!

# Gravity and Orbit

Use your textbook to help you fill in the blanks.

## What is gravity?

1. Gravity is a \_\_\_\_\_, or pull, between any two objects due to their mass.
2. Mass is a measure of the \_\_\_\_\_ in an object.
3. Gravity acts over \_\_\_\_\_.
4. The pull of gravity between Earth and the Sun acts across \_\_\_\_\_ kilometers of space.

## What affects the force of gravity?

5. As the \_\_\_\_\_ of an object increases, the force of gravity increases.
6. As the distance between two objects increases, the force of gravity between them \_\_\_\_\_.
7. A truck weighs more than a car because the truck's \_\_\_\_\_ is greater than the car's.

## What keeps objects in orbit?

8. Planets are held in their orbits by the \_\_\_\_\_ between them.
9. As a planet orbits the Sun, it tends to \_\_\_\_\_ toward the Sun, but at the same time, its \_\_\_\_\_ tends to make it move away from the Sun.

- 10.** The effect of these two motions makes the planets move in a \_\_\_\_\_ called an ellipse.

**What causes the tides?**

- 11.** The pull of gravity from the Sun and the Moon cause a \_\_\_\_\_ or bump in the surface of the Earth.
- 12.** Gravitational pull of the Sun and Moon causes the \_\_\_\_\_, or the rise and fall of the ocean's surface.
- 13.** When the Sun and Moon line up and pull in the same direction, higher high tides and lower low tides, called \_\_\_\_\_ result.
- 14.** Smaller tides, or \_\_\_\_\_ come when the Sun and Moon pull in different directions and their pulls partly cancel each other.

**Summarize the Main Idea**

- 15.** What is gravity, and how does it affect planets and oceans?

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## Gravity and Orbit

- |                         |                      |                        |
|-------------------------|----------------------|------------------------|
| <b>a.</b> ellipse       | <b>d.</b> mass       | <b>g.</b> spring tides |
| <b>b.</b> forward speed | <b>e.</b> neap tides | <b>h.</b> tide         |
| <b>c.</b> gravity       | <b>f.</b> orbit      |                        |

### Fill in the blanks.

1. \_\_\_\_\_ The force of attraction, or pull, between any two objects due to their mass.
2. \_\_\_\_\_ A measure of the amount of matter in an object.
3. \_\_\_\_\_ Tends to make a planet move away from the Sun.
4. \_\_\_\_\_ A closed curve that is shaped something like a chicken egg.
5. \_\_\_\_\_ The path an object takes around another object, as planets do around the Sun and moons do around their planets.
6. \_\_\_\_\_ The rise and fall of the ocean's surface.
7. \_\_\_\_\_ Higher high tides and lower low tides.
8. \_\_\_\_\_ The tides with the smallest range, more moderate tides.

## Gravity and Orbit

decreases

increases

orbit

distance

mass

tides

gravity

more

### Fill in the blanks.

The force that keeps people from floating off into space also helps keep planets in their orbits, and causes oceans to rise and fall.

\_\_\_\_\_ is the force of attraction, or pull, between any two objects that have mass. Two things determine the strength of gravity between two objects: their total \_\_\_\_\_ and how far apart they are. A person weighs \_\_\_\_\_ on Earth than on the Moon because Earth has a greater mass than the Moon. As the total mass increases, the force of gravity \_\_\_\_\_. That same person would weigh more on Earth than in a spaceship 1000 miles above Earth because of the greater \_\_\_\_\_ from Earth's center. As the distance between objects increases, the force of gravity between them \_\_\_\_\_. The massive gravity of the Sun pulls planets toward it. However, the forward speed of planets tend to make them move away from the Sun. Those two effects make planets \_\_\_\_\_ in a curved path. The gravitational effect of the Sun and the Moon causes the \_\_\_\_\_ to rise and fall.



# Voyager Discoveries

In 1977, NASA launched the Voyager Interstellar Mission to explore Jupiter, Saturn, Uranus, Neptune, and their moons. The trip had to be very precisely planned. Speeds and distances had to be accurately calculated. The two *Voyager* spacecraft had to be close enough to each planet to collect data and to get a pull from that planet's gravity in order to be propelled toward their next destination. At the same time, the spacecraft had to be far enough away from the planets that they would not go into orbit around them. All of NASA's careful planning worked. The *Voyager* mission has provided scientists with new and closer looks at our farthest neighbors.

## Voyager Spacecraft Travel

### Jupiter - 1979:

Images show Jupiter's rings. Volcanic activity is observed on Io, one of Jupiter's moons.

### Saturn - 1980-91:

Scientists get a close look at Saturn's rings. They contain structures that look like spokes or braids. Scientists observed that Titan, one of Saturn's moons, has a thin atmosphere and active geyser-like landforms.

### Uranus - 1986:

Scientists discover the dark rings around Uranus. They also see 10 new moons, bringing Uranus's total to 15 moons. *Voyager* sends back detailed images and data on the planet, its moons, and dark rings.

### Neptune - 1989:

Large storms are seen on the planet. One of these storms is Neptune's Great Dark Spot. Neptune was originally thought to be too cold to support this kind of weather.

After observing these planets, the *Voyager* spacecraft keep traveling. They are the first human-made objects to go beyond the heliosphere. The heliosphere is the region of space reached by the energy of our Sun. It extends far beyond the most distant planets in the Solar System.

**Cause and Effect**

- Look for the reason why something happens to find a cause.
- An effect is what happens as a result of a cause.



**Write About It**  
**Cause and Effect**

1. What would cause the *Voyager* spacecraft to be propelled toward their next destination?

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2. What was an effect of the *Voyager* mission?

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# What would happen if gravity went away?

Read the Writing in Science feature in your textbook.



## Write About It

**Explanatory Writing** You know that the pull of gravity keeps everything on Earth from floating off into space. Look at the picture on page 326 of your textbook. Explain what would happen if gravity suddenly stopped working.

## Planning and Organizing

Explanatory writing requires you to organize your ideas in chronological or time order. When Luis planned to make a mobile to represent the solar system, he needed to list the steps in sequence. Here are some steps that he wrote, number them from 1 to 5 with 1 being the first step.

1. Next, cut out the circles. Punch a hole at the top. \_\_\_\_\_
2. Then, thread the string through the hole in each circle.  
Attach it to a coat hanger. Finally, paste a cutout of the Sun onto the coathanger. \_\_\_\_\_
3. First, look at the sizes of the planets in comparison to each other. \_\_\_\_\_
4. After that, use string to represent how far each planet is from the Sun. \_\_\_\_\_
5. Then, use a compass to draw circles on cardboard to represent each planet. Make sure each circle represents the relative size of each planet. Color each planet and write its name. \_\_\_\_\_

Now write the first draft of your composition. Begin with a paragraph that establishes your topic and briefly describes the important ideas. Then describe the events that occur in chronological order. End with a short summary of the events and how they relate to your topic.

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**Now revise and proofread your instructions. Ask yourself:**

- Have I explained the topic and described the important ideas?
- Have I described the events in time order?
- Have I provided clear descriptions of the events?
- Have I corrected all grammar errors?
- Have I corrected all errors in spelling, punctuation, and capitalization?

# The Solar System

Choose the letter of the best answer.

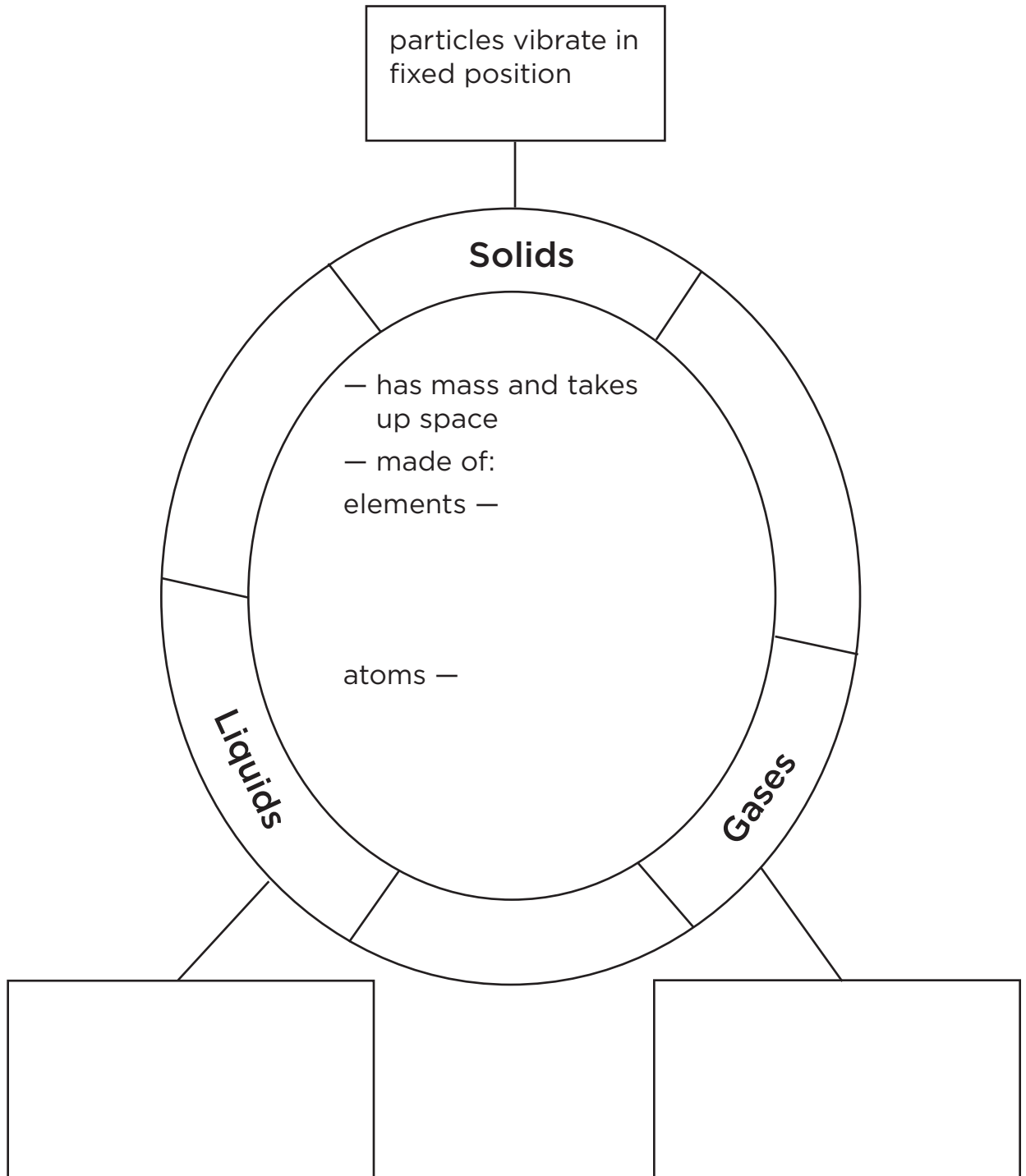
- Any object in space that circles another object is a(n)
  - asteroid.
  - comet.
  - planet.
  - satellite.
- The rise and fall of the ocean's surface is a(n)
  - ellipse.
  - fusion.
  - tide.
  - trembler.
- The system of objects around the Sun is the
  - galaxy.
  - planets.
  - solar system.
  - universe.
- What are bursts of heat and light energy that extend from the surface of the Sun?
  - solar bursts.
  - solar flares.
  - solar radiation.
  - solar winds.
- A device that uses lenses to focus light so that distant objects can be seen is a(n)
  - magnifying lens.
  - microscope.
  - telegraph.
  - telescope.
- A closed, curved orbit shaped something like an egg is a(n)
  - ellipse.
  - circle.
  - revolution.
  - rotation.

Choose the letter of the best answer.

7. A mixture of ice, dust, and rock that circles the Sun is a(n)  
**a.** asteroid.      **b.** comet.      **c.** meteorite.      **d.** meteoroid.
8. What do we call an object that produces its own heat and light energy?  
**a.** asteroid      **b.** comet      **c.** planet      **d.** star
9. The force of attraction between two objects due to their mass is  
**a.** fission.      **b.** fusion.      **c.** gravity.      **d.** magnetism.
10. What do we call the smashing together of atoms in the Sun?  
**a.** fission  
**b.** fusion  
**c.** solar flare  
**d.** solar wind
11. A rock that orbits the Sun, and lies in a belt between Mars and Jupiter is a(n)  
**a.** artificial satellite.  
**b.** comet.  
**c.** meteorite.  
**d.** asteroid.
12. Meteoroids that are caught by Earth's gravity and fall through its atmosphere are called  
**a.** meteors.  
**b.** stars.  
**c.** comets.  
**d.** rocks.

# Types of Matter

Complete the concept map with the information you learned about the types of matter.



# Metamorphosis

Read the Literature feature in your textbook.



## Write About It

**Response to Literature** The famous poet Carl Sandburg is using water and ice to talk about changes in life and our ability to remember them. Why do you think he does this? Now it's your turn. What other changes in matter do you know about? Write about other changes in matter the poet could have used in his poem.

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# Properties of Matter

Use your textbook to help you fill in the blanks.

## How can you measure amounts of matter?

1. \_\_\_\_\_ is the measure of how much space an object takes up.
2. An object sinking in water pushes an \_\_\_\_\_ volume out of the way.
3. \_\_\_\_\_ is anything that has mass and takes up space.
4. The amount of matter in an object is called its \_\_\_\_\_ .

## How can mass be felt?

5. Weight is how strongly \_\_\_\_\_ pulls on an object.
6. Weight and \_\_\_\_\_ are not the same thing.
7. Volume, mass, and weight can be measured with balances, scales, or \_\_\_\_\_ .

## What are the states of matter?

8. Solid, \_\_\_\_\_ , and gas are the three states of matter.
9. Particles in a \_\_\_\_\_ vibrate back and forth but stay in a relatively fixed position.
10. Particles in a liquid move \_\_\_\_\_ than those in a solid, but they stay close together.
11. Particles in a gas are in \_\_\_\_\_ motion and have lots of empty space between them.

**How do substances change from one state to another?**

- 12.** When a substance changes from one state of matter to another, it is called a \_\_\_\_\_ .
- 13.** The \_\_\_\_\_ is the temperature at which a substance changes from a solid to a liquid.
- 14.** Substances also have a \_\_\_\_\_ , which is the temperature at which a liquid changes to a gas.
- 15.** A substance can also reach its \_\_\_\_\_ , which is when a liquid changes to a solid.
- 16.** \_\_\_\_\_ occurs when a substance changes from liquid to a gas.
- 17.** Evaporation occurs at all temperatures, but boiling only occurs at \_\_\_\_\_ particular temperature.
- 18.** Changes of state are \_\_\_\_\_ changes since new substances are not created.

**How tightly packed are solids, liquids, and gases?**

- 19.** An object that floats in a liquid must be \_\_\_\_\_ dense than the liquid.

**Summarize the Main Idea**

- 20.** What are the differences in solid, liquid, and gaseous states of matter?

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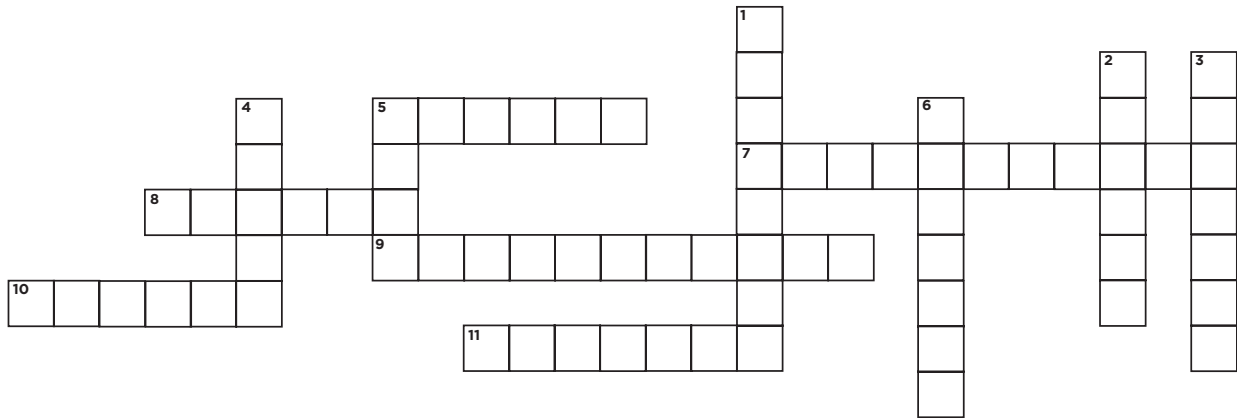
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# Properties of Matter

boiling	freezing	melting	sublimation
density	mass	phase	volume
evaporation	matter	states	weight

Fill in the crossword puzzle using the clues below.



### Down

1. The point at which a substance changes from a liquid to a solid
2. How strongly gravity pulls on an object
3. The amount of mass for each milliliter of a substance
4. A \_\_\_\_\_ change occurs when a substance changes forms.
5. The measure of how much matter is in an object
6. The point at which a substance changes from a liquid to a gas

### Across

5. Anything that has mass and takes up space
7. A direct change from liquid to gas
8. Solid, liquid, and gas are the \_\_\_\_\_ of matter.
9. A direct change from a solid to a gas
10. The amount of space an object takes up
11. Process by which a substance changes from a solid to a liquid

## Properties of Matter

density	gravity	phase change	weight
freezing	mass	physical	volume
gases	motion	solid	

### Fill in the blanks.

Matter is anything that has mass and takes up space.

\_\_\_\_\_, \_\_\_\_\_, and mass are examples of the physical properties of matter. The amount of matter in an object is called its \_\_\_\_\_. Mass can be felt through an object's weight, which is the pull of \_\_\_\_\_ on the object. The states of matter are \_\_\_\_\_, liquid, and gas. The \_\_\_\_\_ of the particles within matter is different. For example, particles in solids stay in place, but particles in \_\_\_\_\_ move rapidly. When matter changes from one form to another, we call it a \_\_\_\_\_. Melting, boiling, \_\_\_\_\_, sublimation, and evaporation are methods by which matter changes into another form. Changes of state do not make new substances, so they are \_\_\_\_\_ changes. \_\_\_\_\_ shows how tightly packed solids, liquids, and gases are. The density of an object determines if it will sink or float in a liquid.

# Elements

Use your textbook to help you fill in the blanks.

## What is matter made of?

1. All matter is made of \_\_\_\_\_ that combine to form molecules.
2. An atom is the \_\_\_\_\_ part of an element, with the same chemical properties as the element.
3. Matter is composed of basic building blocks called \_\_\_\_\_.
4. When matter is broken down into its simplest parts, it forms \_\_\_\_\_ elements.
5. Each known element \_\_\_\_\_ be broken down into any simpler substances.

## What are the most common elements on Earth?

6. The most common elements on Earth are oxygen, silicon, aluminum, iron, calcium, sodium, \_\_\_\_\_, and magnesium.
7. These \_\_\_\_\_ elements make up 98% of Earth's crust.
8. The remaining 2% are hydrogen, titanium, \_\_\_\_\_, and phosphorus.
9. However, Earth's atmosphere has a different \_\_\_\_\_ than its crust.

10. Only \_\_\_\_\_ elements make up nearly 100% of the air. They are nitrogen, oxygen, and argon.
11. Water is just a \_\_\_\_\_ part of our atmosphere.

**What are the most common elements in living things?**

12. \_\_\_\_\_, hydrogen, and oxygen are the most common elements in plants and animals.
13. Animal bodies contain a great deal of \_\_\_\_\_.
14. \_\_\_\_\_ of human body weight is water.
15. Water is where much of the oxygen and \_\_\_\_\_ come from in our bodies.

**Summarize the Main Idea**

16. What are elements, and where can they be found?

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# Elements

Fill in the blank with the correct word.

1. \_\_\_\_\_ is anything that has mass and takes up space.
2. An \_\_\_\_\_ is the smallest part of an element.
3. An \_\_\_\_\_ is the basic building block of matter.

atom  
element  
matter

Fill in the chart with the correct elements.

The Earth's Crust	The Earth's Atmosphere	Plants and Animals

Use the chart to answer the question.

4. What one common element do all three share?

\_\_\_\_\_

## Elements

animals

carbon

elements

atmosphere

common

oxygen

atom

eight

### Fill in the blanks.

All matter is made from atoms, which combine to form molecules.

Matter is composed of basic building blocks called

\_\_\_\_\_ . Each element is made of only one

kind of \_\_\_\_\_ . Earth's crust is made up of

\_\_\_\_\_ elements. However, the elements in

Earth's \_\_\_\_\_ are different than those in the crust.

The atmosphere is mostly made up of three elements—nitrogen, argon,

and \_\_\_\_\_ . Plants and \_\_\_\_\_ are

also full of elements. Plants and animals have elements in

\_\_\_\_\_ . \_\_\_\_\_ , hydrogen, and

oxygen are the three main elements shared by all living things. Elements

can be found everywhere.



## Classifying Elements

Use your textbook to help you fill in the blanks.

### What are atoms and molecules?

1. \_\_\_\_\_ are made up of atoms.
2. Protons, neutrons, and electrons are in an \_\_\_\_\_ .
3. \_\_\_\_\_ and neutrons are in the nucleus of an atom.
4. \_\_\_\_\_ are outside the nucleus of an atom.
5. All atoms have the \_\_\_\_\_ number of protons and electrons.
6. The identity of an atom is determined by its number of \_\_\_\_\_ , and this is called the atomic number.
7. The \_\_\_\_\_ of an element is a measure of the mass of its atoms.

### What are the properties of elements?

8. Most elements are \_\_\_\_\_ .
9. Metals are shiny when polished, can be shaped without breaking, and conduct heat and \_\_\_\_\_ .
10. An example of a metal element is \_\_\_\_\_ .
11. \_\_\_\_\_ are poor conductors of heat and electricity.
12. \_\_\_\_\_ are elements with properties of both metals and nonmetals.

**What is the Periodic Table of Elements?**

13. Dimitri Mendeleev created the \_\_\_\_\_ in 1869.
14. \_\_\_\_\_ means occurring in cycles.
15. The periodic table arranges the elements in a chart of rows and columns of \_\_\_\_\_ atomic numbers.
16. The \_\_\_\_\_ in the periodic table are called groups or families.
17. The \_\_\_\_\_ in the periodic table are called periods.

**How can we see atoms?**

18. Atoms are too small to see with your \_\_\_\_\_ .
19. The \_\_\_\_\_ replaces the electron and field ion microscopes.
20. The one-angstrom microscope allows scientists to see the \_\_\_\_\_ atoms.
21. Scientists can place atoms in precise locations by \_\_\_\_\_ them with the tip of a scanning tunneling microscope.

**Summarize the Main Idea**

22. Why is the periodic table such an important tool?

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## Classifying Elements

- |                                |                                   |                          |
|--------------------------------|-----------------------------------|--------------------------|
| <b>a.</b> atom                 | <b>e.</b> metalloids              | <b>i.</b> noble gases    |
| <b>b.</b> atomic number        | <b>f.</b> metals                  | <b>j.</b> nonmetals      |
| <b>c.</b> atomic weight        | <b>g.</b> molecule                | <b>k.</b> periodic table |
| <b>d.</b> field ion microscope | <b>h.</b> one-angstrom microscope |                          |

Fill in the blanks with the correct letter.

- \_\_\_\_\_ Elements that are shiny and conduct heat
- \_\_\_\_\_ One of the most powerful new microscopes
- \_\_\_\_\_ Elements are composed of these
- \_\_\_\_\_ The number of protons in the nucleus of an atom
- \_\_\_\_\_ Elements with properties of both metals and nonmetals
- \_\_\_\_\_ A chart listing the different elements and their properties
- \_\_\_\_\_ Elements that are poor conductors of heat, such as bromine
- \_\_\_\_\_ A microscope used to create the first image of an atom
- \_\_\_\_\_ The mass of an atom
- \_\_\_\_\_ A special family of elements that rarely takes part in chemical reactions
- \_\_\_\_\_ Two or more atoms combined create this

## Classifying Elements

atomic number

increasing

neutrons

electrons

metalloids

nucleus

elements

microscopes

periodic table

### Fill in the blanks.

All matter is made of atoms, which may combine to form molecules. Atoms contain small particles called protons, \_\_\_\_\_, and electrons. Protons and neutrons are in the \_\_\_\_\_, but electrons are not. All atoms have the same number of protons and \_\_\_\_\_. The number of protons is the \_\_\_\_\_. Elements can be classified as metals, nonmetals, and \_\_\_\_\_. Dimitri Mendeleev created the \_\_\_\_\_ in 1869. The elements are arranged in \_\_\_\_\_ atomic numbers. The periodic table also shows how \_\_\_\_\_ are grouped. Atoms are too small to see with the eye, so special \_\_\_\_\_ are used to study them. The one-angstrom microscope is one of the most powerful microscopes, and may lead to amazing discoveries in the future.

## Element Discovery

When Mendeleev shuffled his element cards to create the periodic table in 1869, he suspected he wasn't playing with a full deck. Many of the elements had already been discovered, but he believed others would come later.

**1766 Hydrogen**—The most abundant atom in nature is discovered by Henry Cavendish. In 1766, Cavendish is experimenting with materials in his lab when he isolates a gas that is flammable. He realizes that this gas might be a new element and calls it flammable air. The element later gets its name from the Greek words meaning “water forming,” when another scientist discovers that water is made of hydrogen and oxygen.

**1772–74 Oxygen**—Scientists Joseph Priestley and Carl Wilhelm Scheele independently discover that when they heat certain compounds, a new kind of “air” or gas is given off. The new gas makes substances burn five times faster than ordinary air. The new gas is named oxygen from the Greek words meaning “acid former.” That’s because when oxygen combines with other elements, the compounds are usually acidic.

**1868–1895 Helium**—Joseph Lockyer discovers helium in 1868 by studying the Sun’s spectrum with a spectroscope during a solar eclipse. He finds color lines that no element at the time was known to produce. He infers the lines must be due to a new element found only in the Sun. The element is named helium, after Helios, the Greek god of the Sun. In 1895, helium is finally found on Earth in uranium minerals.

**1940 Plutonium**—Scientists in Berkeley, California, create a new element by bombarding uranium with particles of deuterium, a special form of hydrogen. They name the element after the recently discovered planetary body Pluto.

**1952 Einsteinium**—A team of scientists find this element while studying the radioactive debris created when a hydrogen bomb explodes. They name it in honor of scientist Albert Einstein. Only a small amount of einsteinium has ever been produced, and it exists for a short time before it transforms itself into other elements.

The periodic table isn't finished. Elements are still being added to it. In the past 75 years, 26 new elements have been added to the table. That's about one element every three years! If you found a new element, what would you name it?

**Make Inferences**

- Review the information to make inferences about information not stated explicitly.
- List the details that support the inferences you make.



**Write About It**

**Make Inferences** Look at the timeline. When was hydrogen discovered? When was oxygen discovered? What can you infer about the discovery of the composition of water? Read about the discoveries of hydrogen and oxygen to find the clues you need to make an inference.

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# Mixtures

Use your textbook to help you fill in the blanks.

## What is a mixture?

1. A \_\_\_\_\_ is a physical combination of two or more substances blended together to form new substances.
2. Mixtures are \_\_\_\_\_ combined, not chemically combined.
3. In a mixture, the parts can be mixed using \_\_\_\_\_ amounts.
4. For example, Trail Mix has the same parts, but each handful is a different \_\_\_\_\_ of those parts.
5. The \_\_\_\_\_ of a mixture are a blend of the properties from its individual parts.
6. Examples of this are iron-enriched \_\_\_\_\_ and muddy water.

## What are the different types of mixtures?

7. Mixtures are \_\_\_\_\_ by comparing the sizes of particles in them.
8. In \_\_\_\_\_ mixtures, particles are big enough for us to see with our eyes. Potting soil is an example.
9. A suspension mixture may look creamy or cloudy at first, but then its parts settle into \_\_\_\_\_.
10. Salad oil and vinegar and dusty air are examples of \_\_\_\_\_ mixtures.

**What if all the particles are very small?**

11. A \_\_\_\_\_ is a special type of mixture in which the particles of one material are scattered through another and block the passage of light without settling into layers.
12. Liquid-liquid colloids like mayonnaise are called \_\_\_\_\_ .
13. A mixture is called a \_\_\_\_\_ if the particles are the size of atoms, or when one substance dissolves in another.
14. All solutions are \_\_\_\_\_ , which means they have the same makeup throughout.

**How much solute can dissolve?**

15. \_\_\_\_\_ is the greatest amount of solute that a given solvent can dissolve.

**What are the parts of a solution?**

16. A \_\_\_\_\_ does the dissolving.
17. A \_\_\_\_\_ gets dissolved.

**How can you take mixtures apart?**

18. Since mixtures are physical combinations of different substances, they can be \_\_\_\_\_ .

**Summarize the Main Idea**

19. How can you tell the difference among types of mixtures?

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## Mixtures

colloid	homogeneous	solute	solvent
emulsion	mixture	solution	
heterogeneous	solubility	suspension	

Fill in the blanks with the correct word.

1. A \_\_\_\_\_ is a physical combination of two or more substances.
2. \_\_\_\_\_ means consisting of parts that are not the same.
3. \_\_\_\_\_ means consisting of parts that are the same.
4. A \_\_\_\_\_ is a mixture where one substance has dissolved into another substance.
5. A mixture in which the layers are too small to be seen, like whipped cream, is called a(n) \_\_\_\_\_.
6. A liquid-liquid colloid is an \_\_\_\_\_.
7. \_\_\_\_\_ is the greatest amount of a solute that a solvent can dissolve.
8. A \_\_\_\_\_ does the dissolving.
9. A \_\_\_\_\_ gets dissolved.
10. The particles in a \_\_\_\_\_ mixture can easily be seen.

## Mixtures

amount

separated

solute

mixture

size

solutions

physical

solubility

solvent

### Fill in the blanks.

Mixtures are just about everywhere you look. A \_\_\_\_\_ is a physical combination of two or more substances blended together to form a new substance. A mixture is a \_\_\_\_\_ change, not a chemical change. The individual parts of a mixture vary in \_\_\_\_\_. Mixtures are classified by the \_\_\_\_\_ of the particles in them. Heterogeneous mixtures, suspensions, colloids, emulsions, and \_\_\_\_\_ are types of mixtures. A solution has a \_\_\_\_\_ that does the dissolving and a \_\_\_\_\_ that gets dissolved. A certain amount of solvent can only dissolve so much solute, and this amount is called the \_\_\_\_\_. Mixtures can be \_\_\_\_\_ since they are physical combinations of different substances.

## What's in this mixture?

Read the Writing in Science feature in your textbook.



### Write About It

**Narrative Writing** Do some research to write a report about how prospectors panned for gold during the California Gold Rush. What mixtures did prospectors have to separate? Give the steps of the process in order.

### Planning and Organizing

Denise wrote the following sentences for her report. Read each group of sentences. Write MI by the sentence that states the main idea. Write SD by the sentence that contains facts, details, or examples that support the main idea.

1. Some miners came from as far away as the Sandwich Islands.  
\_\_\_\_\_
2. Every new gold strike drew hundreds of miners, coming from all over to stake their claim. \_\_\_\_\_
3. Others came from places up and down the West Coast. \_\_\_\_\_

Now write a main idea sentence for your report and four supporting detail sentences.

MI \_\_\_\_\_

SD \_\_\_\_\_

SD \_\_\_\_\_

SD \_\_\_\_\_

SD \_\_\_\_\_

Now write the first draft of your report on a separate sheet of paper. Introduce the main idea about your topic in your first paragraph. Provide facts and details to back it up. Explain the process of panning for gold in sequence. End with a concluding paragraph that summarizes your important points.

### Revising and Proofreading

Here is a passage Denise wrote for her report about the California Gold Rush. Add a time-order word or phrase in each blank below to help her improve the transition.

\_\_\_\_\_, there was so much gold that miners could pick up nuggets by hand in streams and rivers. They also used the dry-digging method, scratching the gold out of ravines and gulches.

\_\_\_\_\_ the situation changed. Miners had to turn to wet digging, or panning, to find gold. \_\_\_\_\_ miners “wet dug,” or “panned,” they used a pan to scoop up sand and gravel from the bottom of streams and rivers. \_\_\_\_\_ they held the pan under a running stream for a few minutes or swirled water around in it.

**Now revise and proofread your report. Ask yourself:**

- Have I shown sufficient research on the topic of prospecting for gold in California?
- Have I presented a main idea?
- Have I supported my main idea with sufficient facts, details, and examples about panning for gold?
- Have I adequately described the process of panning for gold?
- Have I used time-order words effectively to connect ideas?
- Have I corrected all grammar errors?
- Have I corrected all errors in spelling, capitalization, and punctuation?

# Compounds

Use your textbook to help you fill in the blanks.

## What changes produce new and different substances?

1. A \_\_\_\_\_ occurs when new compounds are formed.
2. The new compounds have different \_\_\_\_\_ from the original substances forming them.
3. In a chemical change, the combination of \_\_\_\_\_ changes.

## What happens when different elements combine chemically?

4. \_\_\_\_\_ are formed by a combination of two or more elements.
5. Compounds are only formed and broken apart by \_\_\_\_\_.
6. The compositions of mixtures vary, but compounds have a \_\_\_\_\_ composition.

## How are compounds represented?

7. \_\_\_\_\_ name compounds and give them a chemical formula.
8. A \_\_\_\_\_ uses symbols to show what elements have combined to form a compound.
9. The formula contains numbers called \_\_\_\_\_.
10. The subscripts indicate the \_\_\_\_\_ of which atoms have combined.

**How can you identify compounds and elements?**

11. Changes in the way atoms are \_\_\_\_\_ together occur when compounds form.
12. Every compound has a unique set of properties that \_\_\_\_\_ it.
13. Scientists use \_\_\_\_\_ and other instruments to identify compounds and their elements.
14. Elements in the compound are heated until they \_\_\_\_\_ .
15. The \_\_\_\_\_ of the flame identifies the elements in the compound.

**How can compounds be put to use?**

16. \_\_\_\_\_ that make our lives easier are produced from compounds.
17. Products from \_\_\_\_\_ are examples of this.
18. Compounds made from hydrogen and carbon are called \_\_\_\_\_ .
19. \_\_\_\_\_ are hydrocarbons that have been chemically changed into familiar plastic and rubber materials.

**Summarize the Main Idea**

20. Explain how a compound is different from a mixture.

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## Compounds

- |                            |                        |                      |
|----------------------------|------------------------|----------------------|
| <b>a.</b> chemical change  | <b>d.</b> hydrocarbons | <b>g.</b> subscripts |
| <b>b.</b> chemical formula | <b>e.</b> molecules    |                      |
| <b>c.</b> compounds        | <b>f.</b> polymers     |                      |

Match the correct letter with the description.

1. \_\_\_\_\_ This creates a new compound.
2. \_\_\_\_\_ The ratio of elements in a compound.
3. \_\_\_\_\_ The numbers in a chemical formula.
4. \_\_\_\_\_ The products of hydrogen and carbon.
5. \_\_\_\_\_ Familiar plastic and rubber materials composed of hydrocarbons.
6. \_\_\_\_\_ The combination of two or more atoms.
7. \_\_\_\_\_ These are formed by chemical changes.

## Compounds

chemical formula

crude oil

molecules

compounds

heated

products

constant

mass spectrometers

subscripts

### Fill in the blanks.

A chemical change creates a new substance through the combination of atoms. \_\_\_\_\_ are formed by chemical changes. A compound has a \_\_\_\_\_ composition unlike the varying composition of mixtures. Chemists name compounds, and give them a \_\_\_\_\_. A chemical formula uses element symbols and \_\_\_\_\_ to indicate the number and type of atoms combined in the substance. Scientists use \_\_\_\_\_ and other instruments to identify compounds. Elements in the compound can be \_\_\_\_\_ until they glow a characteristic color. Many \_\_\_\_\_ come from compounds. For example, gasoline and kerosene come from \_\_\_\_\_. Chemists can now custom design \_\_\_\_\_, which help create medicines. Compounds like hydrocarbons make our lives easier.



## Types of Matter

Choose the letter of the best answer.

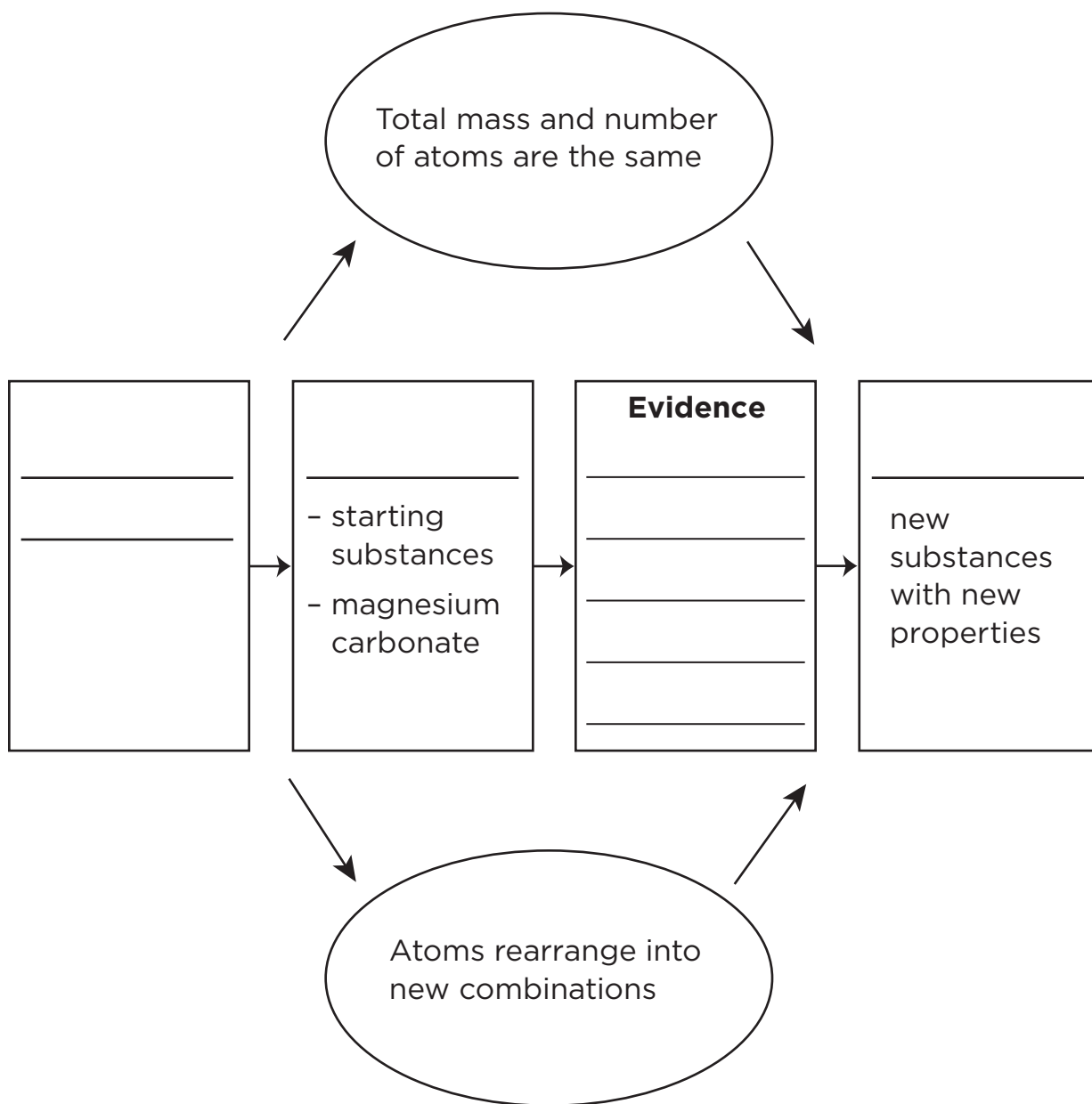
- What are elements made of?  
**a.** atoms      **b.** electrons      **c.** molecules      **d.** protons
- The amount of matter in an object is called its  
**a.** density      **b.** mass      **c.** volume      **d.** weight
- A physical combination blending two or more substances is called a(n)  
**a.** element      **b.** emulsion      **c.** mixture      **d.** suspension
- Two or more elements combine chemically to form a(n)  
**a.** colloid      **b.** compound      **c.** mixture      **d.** solution
- Solid, liquid, and gas are  
**a.** boiling points      **c.** particles  
**b.** freezing points      **d.** states of matter
- The amount of space that an object takes up is its  
**a.** density      **b.** mass      **c.** size      **d.** volume
- The greatest amount of solute that can dissolve in a solvent is its  
**a.** density      **b.** solution      **c.** solubility      **d.** suspension
- A particle that contains more than one atom joined together is a(n)  
**a.** compound      **b.** matter      **c.** molecule      **d.** suspension
- The amount of mass for a given volume of a substance is its  
**a.** density      **b.** mass      **c.** volume      **d.** weight

Choose the letter of the best answer.

10. What is anything that has mass and takes up space?  
 a. atom                  b. compound              c. element              d. matter
  
11. A compound is formed by a(n)  
 a. chemical change                                      c. mixture  
 b. emulsion    d. solution
  
12. What do we call the temperature that a liquid changes into a gas?  
 a. boiling point    c. freezing point  
 b. evaporation point                                      d. melting point
  
13. One substance dissolves into another substance to form a  
 a. colloid                  b. compound              c. mixture              d. solution
  
14. The strength with which gravity pulls on an object is its  
 a. density                  b. mass                      c. volume                  d. weight
  
15. Elements in what group are poor conductors of heat and electricity?  
 a. compounds              b. metals                  c. metalloids              d. nonmetals
  
16. Elements that rarely take part in chemical reactions are the  
 a. halogens    c. nonmetals  
 b. metalloids    d. noble gases
  
17. Colloids formed by mixing two liquids are  
 a. emulsions              b. mixtures              c. solutes                  d. solvents
  
18. Direct change from solid to gas is called  
 a. boiling                  b. evaporation              c. freezing                  d. sublimation

# Changes in Matter

Complete the concept map with the information you learned about the Solar System.



# The Grizzly Man

Read the Literature feature in your textbook.



## Write About It

**Response to Literature** The article describes a suit designed to withstand bear attacks. If you were an inventor, what kind of suit would you invent? Write a fictional narrative describing your suit and its uses.

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# Chemical Reactions

Use your textbook to help you fill in the blanks.

## What are chemical changes?

1. Another name for a chemical change is a chemical \_\_\_\_\_ .
2. In this process, a starting substance chemically changes into a new \_\_\_\_\_ .
3. The starting substance is called the \_\_\_\_\_ .
4. The new substance created is called the \_\_\_\_\_ .
5. Chemists may say that reactants \_\_\_\_\_ products.
6. The total mass of the reactants always \_\_\_\_\_ the total mass of the products.
7. Since the numbers of atoms stay the same in a chemical reaction, it means that the atoms \_\_\_\_\_ into new combinations.
8. \_\_\_\_\_ is a type of chemical reaction.

## What are the most reactive elements?

9. \_\_\_\_\_ elements are much more likely to take part in chemical reactions because they have a high reactivity.
10. \_\_\_\_\_ means that they react easily with other elements.
11. The most reactive family of metals are the \_\_\_\_\_ metals like lithium and potassium.

- 12.** The most reactive nonmetals are in the \_\_\_\_\_ family, like fluorine and chlorine.
- 13.** When reactive elements combine, they give off heat and \_\_\_\_\_ .

**What are signs of a chemical change?**

- 14.** A precipitate is a solid formed after \_\_\_\_\_ are mixed.
- 15.** One sign of a chemical change is a(n) \_\_\_\_\_ being produced, indicated by the release of bubbles.
- 16.** \_\_\_\_\_ increase is another sign of a chemical change that releases energy.
- 17.** A change in \_\_\_\_\_ can also indicate a chemical reaction, as when metal tarnishes.

**How can chemical reactions be used?**

- 18.** Cooking and \_\_\_\_\_ are examples of chemical reactions.
- 19.** Chemical \_\_\_\_\_ supply most needs for energy.

**Summarize the Main Idea**

- 20.** What occurs in a chemical reaction and why are chemical reactions important?

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## Chemical Reactions

- |                             |                          |                      |
|-----------------------------|--------------------------|----------------------|
| <b>a.</b> alkali metals     | <b>d.</b> photosynthesis | <b>g.</b> reactant   |
| <b>b.</b> chemical reaction | <b>e.</b> precipitate    | <b>h.</b> reactivity |
| <b>c.</b> halogens          | <b>f.</b> product        |                      |

Match the correct term with the statement that best describes it.

- \_\_\_\_\_ A solid that forms during a chemical reaction when solutions are mixed.
- \_\_\_\_\_ The family of nonmetal elements with high reactivity, like fluorine.
- \_\_\_\_\_ The ability of metals to react easily with one another.
- \_\_\_\_\_ Another name for a chemical change.
- \_\_\_\_\_ The most reactive family of metals.
- \_\_\_\_\_ The new substance created in a chemical reaction.
- \_\_\_\_\_ The starting substance in a chemical reaction.
- \_\_\_\_\_ A common chemical reaction in plants.

## Chemical Reactions

atoms	products	reactivity	respiration
bakes	halogens	rearrange	
plastics	chemical	chemically	

### Fill in the blanks.

Chemical changes are called chemical reactions. In chemical reactions, substances \_\_\_\_\_ change into new substances.

Another way to say this is that reactants yield \_\_\_\_\_.

The numbers of \_\_\_\_\_ stays the same in a chemical reaction, they just \_\_\_\_\_ into new combinations.

Photosynthesis and \_\_\_\_\_ are examples of chemical reactions. Metallic elements are common in chemical reactions because they have a high \_\_\_\_\_. Alkali metals are the most reactive metals and \_\_\_\_\_ are the most reactive nonmetals. The release of a gas, formation of a precipitate, or a change in color are common indications of a \_\_\_\_\_ reaction.

Chemical reactions occur in the kitchen when one cooks or

\_\_\_\_\_. Clothes, \_\_\_\_\_, and

fuels are created by chemical reactions. These reactions are a part of everyday life.



## Metals and Alloys

Use your textbook to help you fill in the blanks.

### What are metals?

1. Metals such as gold, copper, and silver make up \_\_\_\_\_ of the periodic table.
2. Metals are good \_\_\_\_\_ of heat and electricity.
3. Mercury and bromine are two elements that are \_\_\_\_\_ at room temperature.
4. The most abundant metal is \_\_\_\_\_ .
5. Because it was used thousands of years ago and is also used today to make pipes, \_\_\_\_\_ is the oldest metal in use.
6. Metals are useful for many purposes because of their wide range of \_\_\_\_\_ points.
7. Metals with \_\_\_\_\_ melting points like titanium are useful because they can withstand high temperatures.
8. Since \_\_\_\_\_ has the highest melting point of any metal, it is used to make the filaments in light bulbs.

### What do metals have in common?

9. Metals have good electrical \_\_\_\_\_ because electricity flows through metals easily.
10. Nonmetals like wood are good \_\_\_\_\_ because they resist the flow of electricity.
11. Electricity sent through wires must be covered by insulators or the energy would get lost into the surroundings as \_\_\_\_\_ .

12. Metals are also good \_\_\_\_\_ conductors, which means heat flows readily through them.

**How hard are metals?**

13. Metals share the ability to be pressed or pulled into shape without \_\_\_\_\_ or breaking.
14. Any metal that can be rolled or pounded into flat sheets is \_\_\_\_\_ .
15. \_\_\_\_\_ is a property of metals that means it can be drawn into strands of wire.
16. As metals get harder, they get more brittle and are more likely to \_\_\_\_\_ .

**What are metal compounds and mixtures?**

17. \_\_\_\_\_ occurs when a metal reacts chemically to form a new compound.
18. \_\_\_\_\_ are formed when two metals, or a metal and nonmetal, are combined.
19. Alloys are used to harden metals, fight corrosion, improve sound quality and make tools \_\_\_\_\_ .

**Summarize the Main Idea**

20. Why are metals and alloys used in so many materials?

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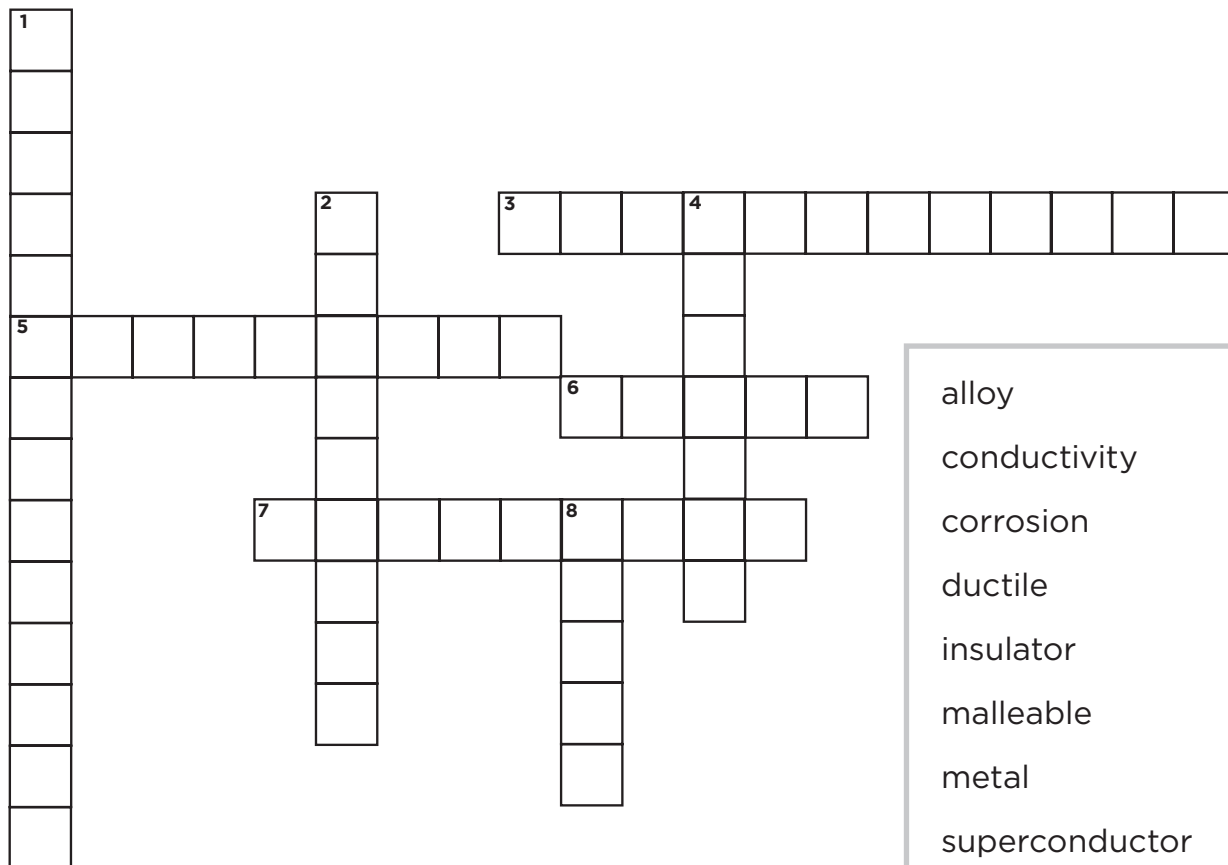
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# Metals and Alloys

Use the clues to fill in the crossword puzzle.



alloy  
 conductivity  
 corrosion  
 ductile  
 insulator  
 malleable  
 metal  
 superconductor

## Down

1. A material that loses its resistance to electrical flow at very cold temperatures
2. Something that does not allow electricity to flow easily
4. Property of metal that can be drawn out into strands of wire
8. A mixture of metals, or metals and nonmetals

## Across

3. The ability of metals to allow electricity to flow easily
5. The gradual eating away of a metal
6. Good conductors of heat and electricity
7. Property of a metal that can be rolled or pounded into flat sheets

## Metals and Alloys

alloys	denting	insulators	shiny
conductors	electricity	melting	strengthen
corrode	high	pressed	thermal

### Fill in the blanks.

Three-fourths of the elements in the periodic table are metals. Metals are good \_\_\_\_\_ of heat and electricity. Metals like gold and aluminum appear \_\_\_\_\_ when polished. Metals have a wide range of \_\_\_\_\_ points, which makes them useful for many purposes. Metals with \_\_\_\_\_ melting points are useful in spacecrafts and aircrafts because they won't melt under intense heat. All metals let \_\_\_\_\_ flow through them easily. Nonmetals such as wood and glass serve as electrical \_\_\_\_\_. The same properties that make metals good electrical conductors also make them good \_\_\_\_\_ conductors. Metals can be \_\_\_\_\_ or pulled into shape. The hardness of a metal is measured by \_\_\_\_\_ it. Metals can \_\_\_\_\_, which causes them to be eaten away. \_\_\_\_\_ are made by mixing metals or metals and nonmetals together. Alloys \_\_\_\_\_ metals and help prevent corrosion.

# Salts

Use your textbook to help you fill in the blanks.

## What is a salt?

1. A \_\_\_\_\_ is a compound made of a metal and a nonmetal.
2. Salts consist of atomic particles that have an \_\_\_\_\_ charge.
3. The metallic atoms have a positive charge, while the nonmetallic atoms have a \_\_\_\_\_ charge.
4. The strong \_\_\_\_\_ of positive and negative particles is what holds a salt together.
5. Salts have \_\_\_\_\_ melting points.
6. Since salt is made of \_\_\_\_\_ and nonmetal elements, it also conducts electricity well.

## What are acids and bases?

7. An \_\_\_\_\_ is a substance that tastes sour and turns blue litmus red.
8. Acid formulas usually start with \_\_\_\_\_ because they have hydrogen atoms combined with other atoms in their molecules.
9. Acids can be used to form \_\_\_\_\_.
10. A \_\_\_\_\_ is a substance that tastes bitter and turns red litmus paper blue.
11. Bases feel \_\_\_\_\_ like soap, but they can also burn your skin.

- 12.** When bases react chemically with acids, they form salts and \_\_\_\_\_ .
- 13.** When an acid and a base combine to form a salt and water, it is called \_\_\_\_\_ .

**Are all acids and bases equally strong?**

- 14.** The strength of an acidic solution is called its \_\_\_\_\_ .
- 15.** The strength of a base solution is called its \_\_\_\_\_ .
- 16.** The \_\_\_\_\_ measures the strength of acids and bases by measuring the amount of charged hydrogen particles.

**How do we use salts?**

- 17.** Salts have been considered precious since ancient times, and today are used to \_\_\_\_\_ and season foods.
- 18.** Some salts are compounds of \_\_\_\_\_ metals, and contact with these salts is dangerous and should be avoided.

**What is table salt really?**

- 19.** Table salt is \_\_\_\_\_ mixed with other compounds.

**Summarize the Main Idea**

- 20.** Why do salts have the ability to conduct electricity?

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## Salts

- |                      |                                   |                    |
|----------------------|-----------------------------------|--------------------|
| <b>a.</b> acid       | <b>d.</b> base                    | <b>g.</b> pH scale |
| <b>b.</b> acidity    | <b>e.</b> indicators              | <b>h.</b> salt     |
| <b>c.</b> alkalinity | <b>f.</b> neutralization reaction |                    |

Match the correct term to its description.

- \_\_\_\_\_ A substance that tastes bitter and has a pH between 7 and 14.
- \_\_\_\_\_ The strength of a basic solution.
- \_\_\_\_\_ This is used to measure the strength of an acid or base.
- \_\_\_\_\_ The reaction that occurs when an acid and a base combine to form a salt and water.
- \_\_\_\_\_ A substance that tastes sour and has a pH between 0 and 7.
- \_\_\_\_\_ The strength of an acidic solution.
- \_\_\_\_\_ A compound of metallic and nonmetallic elements.
- \_\_\_\_\_ These change colors to identify substances.

## Salts

acids

conductors

neutralization

ancient

pH scale

salts

charges

nonmetallic

water

### Fill in the blanks.

Salts are compounds made of metallic and nonmetallic elements. \_\_\_\_\_ are composed of metallic elements that have positive charges, and \_\_\_\_\_ elements that have negative charges. These \_\_\_\_\_ hold a salt together. Because salts are made of charged particles, they are \_\_\_\_\_ of electricity. \_\_\_\_\_ and bases can also be used to form salts. Bases react chemically with acids to form salts and \_\_\_\_\_. This is called \_\_\_\_\_ because water is formed. The strength of acids and bases is measured on the \_\_\_\_\_. Salts have been used since \_\_\_\_\_ times. Salts are used today for purposes such as preserving and seasoning food and even de-icing a plane.



## Meet Christina Elson

Christina Elson is a scientist at the American Museum of Natural History. She studies how salt was used by the ancient Aztec culture.

From the 12th to 16th centuries, the Aztecs lived in the area that is now Mexico. This area was very rich in salt, which is a natural mineral resource that is mined from the ground. Christina studies a region in Mexico where salt was obtained from deposits around a dried lake bed. The Aztecs turned these deposits into different kinds of salt. First, they collected the salty soils by scraping and digging them out of the ground. Then they filtered water through the soils to dissolve out the salts into big pots. The final step required boiling the salt solution so the water evaporated away. The salt remained behind in the form of crystals.

Aztecs used salt for much more than a cooking spice. In one Aztec town, Christina found thousands of ceramic fragments, pieces of clay pots that were used to transport salt for sale or trade. She also found that salt was used to dye cloth. Colorfully dyed cotton cloth was a valuable product because it was greatly desired by the Aztec nobles. Aztec women learned to spin cloth at an early age. The cloth was dyed with pigment in a hot watery dye-bath. When salt was added to the dye-bath, it helped the pigment “stick” to the cloth. The salt combined with the color pigment to make a compound that could not be dissolved in water.

Salt was important to many other ancient cultures, and continues to be important today. Salt can be used to preserve food so it can be stored for a long time without refrigeration; to prepare and preserve animal skins for clothing; and to make soap. Salt’s value stems from its usefulness, durability, and portability.

**Draw Conclusions**

- Use information in the text and background knowledge.
- Support your conclusions with information found in the text.



**Write About It**  
**Draw Conclusions**

1. How did the Aztecs change a mineral resource into a finished product?

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2. What would happen to the colors in Aztec cloth when washed if salt was not part of the dye-bath?

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## Clean Up

Read the Writing in Science feature in your textbook.



### Write About It

**Explanatory Writing** Do research online to find other products that come from the reaction of an acid and a base. Choose one of those products and write out instructions to make it. Explain clearly what the finished product will look like and do.

### Planning and Organizing

Alicia planned to write instructions for how to model an erupting volcano. Organize the steps she wrote from 1 to 4, with 4 being the last step.

- A. Gather all your ingredients and equipment. \_\_\_\_\_
- B. Finally, pour the vinegar mixture into the bottle of sodium carbonate. \_\_\_\_\_
- C. Then prepare your base. Use the funnel to pour sodium carbonate into a small plastic bottle. Fill the bottle to the halfway point. \_\_\_\_\_
- D. Pour the vinegar into a measuring cup. Add a few drops of the red food coloring to the vinegar and stir. \_\_\_\_\_

Write the purpose of your instructions, then write five steps in sequence.

I plan to write instructions to make \_\_\_\_\_

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Now write the first draft of your instructions on a separate sheet of paper. Begin with a paragraph that explains the purpose of the instructions and tells what the finished product will look like. Then write the list of materials needed. Arrange the steps in sequence. End with a paragraph that explains the chemical reaction.

### Revising and Proofreading

Here are some sentences that Alicia wrote for her instructions. Each sentence contains a grammatical error. Find the error and correct it. Write the corrected sentence on the lines.

1. Pour the vinegar into the sodium carbonate and watch the liquid raise.

\_\_\_\_\_

2. A real volcano erupt when the pressure builds up.

\_\_\_\_\_

3. This demonstration will shown what an erupting volcano looks like.

\_\_\_\_\_

4. A chemical reaction occurs when a base was combined with an acid.

\_\_\_\_\_

5. Sit the bottle in the middle of the pile of gravel.

\_\_\_\_\_

**Now revise and proofread your instructions. Ask yourself:**

- Have I described what the finished product looks like and does?
- Have I listed the materials needed?
- Have I provided step-by-step instructions in time order?
- Have I given clear details that are easy to follow?
- Have I corrected all grammar errors?

## Changes in Matter

Choose the letter of the best answer.

- At very cold temperatures, what loses all resistance to the flow of electricity?
  - conductors
  - insulators
  - superconductors
  - superinsulators
- New compounds made during chemical reactions are
  - malleable.
  - products.
  - reactants.
  - reactions.
- About three-fourths of the elements on the Periodic Table are
  - alloys.
  - compounds.
  - metals.
  - metalloids.
- What occurs when bases react with acids to make salts and water?
  - double replacement reaction
  - exothermic reaction
  - neutralization reaction
  - single replacement reaction
- A mixture of two or more metals is a(n)
  - alloy.
  - ductile.
  - malleable.
  - reaction.
- What may be used to identify an acid or a base?
  - alkaline
  - indicator
  - salt
  - reactant
- What property allows electricity to pass easily through metals?
  - conductivity
  - corrosiveness
  - ductility
  - malleability
- The strength of a basic solution is called its
  - acidity.
  - alkalinity.
  - conductivity.
  - concentration.

Choose the letter of the best answer.

9. Any metal that can be drawn into strands of wire is said to be  
a. compliant.    b. ductile.    c. malleable.    d. yielding.
10. A solid that forms in a solution during a chemical reaction is a(n)  
a. acid.    b. alkaline.    c. base.    d. precipitate.
11. Elements that easily take part in chemical reactions have a high  
a. atomic mass.    c. productivity.  
b. atomic number.    d. reactivity.
12. What process occurs when metals combine chemically with nonmetals?  
a. adaptation    b. corrosion    c. ductility    d. reactivity
13. Any metal that can be rolled or pounded into thin sheets is said to be  
a. compliant.    b. ductile.    c. elastic.    d. malleable.
14. A substance that tastes sour and turns litmus paper red is a(n)  
a. acid.    b. base.    c. indicator.    d. pH.
15. Starting substances in a chemical reaction are called  
a. alkaline.    b. basic.    c. products.    d. reactants.
16. Substances that resist the flow of electricity are  
a. conductors.    b. ductile.    c. insulators.    d. malleable.
17. A substance that tastes bitter and turns litmus paper blue is a(n)  
a. acid.    b. base.    c. indicator.    d. pH.