BUILDING SKILLS
Reading and Writing
Instructions for Copying

Answers are printed in non-reproducible blue. Copy pages on a light setting in order to make multiple copies for classroom use.
**LIFE SCIENCE**

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Dragons of the Sea
by Elizabeth Schleichert

Read the Unit Literature feature in your textbook.

Write About It
Response to Literature The name “leafy seadragon” sounds almost like a plant. Is a leafy seadragon a plant or an animal? How can you tell? Write an essay to compare and contrast plants and animals.

Possible answer: The leafy seadragon is an animal. It’s an animal because it eats other animals, like baby shrimp. Plants and animals have a lot of things in common. They are both living things that are made of cells. They both need food, air, and water. They are different because plants can make their own food, but animals have to eat other things, like plants and other animals. Plants also stay in one place, but animals can move around.
Kingdoms of Life

Complete the concept map about the classification of living things. Some examples have been done for you.

1. water
2. food
3. oxygen
4. a place to live

Living Things

- need
- carry out
- are classified in six kingdoms
- the 5 basic life functions

Plants can be classified by their structures and how they reproduce.

- seeds
- spores

Plants have a life cycle that includes pollination, fertilization, and germination.
Cells

Use your textbook to help you fill in the blanks.

What are living things?
1. People, ______ plants ______, and ______ animals ______ are living things.

2. Living things need water, food, a place to live, and most need ______ oxygen ______ to survive.

3. All living things perform five basic jobs, or life functions.
   a. They use ______ food ______ for energy.
   b. They ______ grow ______ and develop.
   c. They ______ reproduce ______ more of their kind.
   d. They respond to their ______ environment ______.
   e. They get rid of ______ wastes ______.

4. All living things, also called organisms, are made of ______ cells ______.

How do plant and animal cells compare?
5. All cells have smaller parts that work to keep the cell ______ alive ______.

6. Plant cells contain ______ chlorophyll ______, a substance that plants use to capture the ______ Sun’s ______ energy to make food.

7. Animals cannot make their own ______ food ______ because they do not have chlorophyll.
How are cells grouped?

8. Cells are grouped by the ________ jobs ________ they do.

9. A group of similar cells that carries out a certain job is called a ________ tissue ________ .

10. Tissues in a group are called an ________ organ ________ .

11. You have many organs that work together in an organ ________ system ________ .

How can you see cells?

12. A microscope works like a hand lens by making something ________ small ________ look much ________ bigger ________ .

Critical Thinking

13. Which do you think would be more harmful to an organism: a damaged cell or a damaged organ?

Cells are the building blocks of all living things. Cells form tissues, and tissues form organs. If the cell of a single-celled organism gets damaged, the organism could die. If it’s a multi-celled organism, then other cells can do the job of the damaged cell. If too many of the same cells are damaged, then the organ will be damaged.

A damaged organ is more harmful to an organism than a damaged cell.
Cells

Use the clues below to complete the word puzzle.

Across
2. living thing
4. young organisms of parents
6. rigid outer coverings of plant cells
7. similar cells working together

Down
1. 5 basic jobs of living things
2. organs working together
3. tissues working together
4. gas in the air
5. smallest part of living thing
Cells

Fill in the blanks.

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<th>offspring</th>
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<td>living</td>
<td>organisms</td>
<td>small</td>
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</table>

Everything in the world can be placed into one of two groups. There are living things and nonliving things. All living things need water, food, a place to live, and most need oxygen. Also, all living things carry out five life functions. First, they need food for energy. Second, living things grow and develop. Third, they respond to the environment, and fourth, they make more of their own called offspring. Fifth, living things get rid of wastes.

Living things, also called organisms, are made of cells. Cells are too small to see with just your eyes. A tool called a microscope is used.
Classifying Living Things

Use your textbook to help you fill in the blanks.

How are living things classified?

1. Scientists place organisms into one of six groups, or ___________.

2. Organisms in the same kingdom have similar ___________.

How can organisms be grouped within a kingdom?

3. Traits are used to sort organisms into smaller ___________.

4. The smaller groups in a kingdom include:
   a. phylum
   b. ___________
   c. ___________
   d. ___________
   e. ___________
   f. ___________

What kinds of organisms have only one cell?

5. Three kingdoms that include organisms made up of one cell are ___________, ___________, and ___________.

6. Tiny organisms are also called ___________.

7. Bacteria have no cell ___________ and few cell parts.

8. A paramecium is a protist that has a structure which pumps extra ___________ out of its cell.
9. Fungi have a cell nucleus and a __________ cell wall, just as plants do.

How are organisms named?

10. The scientific name for an __________ organism is made up of a genus name and species name.

11. Scientists have named about 1.7 million __________ species of organisms.

Critical Thinking

12. Using the chart on page 37 of your textbook, think of the traits that an organism from a different order, family, genus, and species might have. Name an animal from that species.

Possible answer: This animal would probably not have long, sharp front teeth, a bushy tail, or a brown back and white front. It might have a tail covered with scales. It might have short, sharp teeth. An example of an organism from a different order, family, genus, and species is a lizard.
Classifying Living Things

Match each word with its definition.

1. _____ protists  
   a. a group of organisms with some members that make their own food (algae) and some that eat other organisms to live (paramecia)

2. _____ diseases  
   b. organisms made up of cells with a cell wall and a nucleus but without chloroplasts

3. _____ trait  
   c. the system used for identifying organisms

4. _____ fungi  
   d. the group made up of one type of organism

5. _____ kingdom  
   e. a characteristic of a living thing used to identify and classify it

6. _____ bacteria  
   f. the largest group into which organisms can be classified

7. _____ species  
   g. the smallest one-celled organisms

8. _____ classification  
   h. the harmful effects of some microorganisms
Classifying Living Things

Fill in the blanks.

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<tr>
<th>class</th>
<th>genus</th>
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<td>kingdom</td>
<td>six</td>
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<tr>
<td>family</td>
<td>one</td>
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Scientists study the traits of living things in order to identify and classify them. Scientists divided Earth’s organisms into six groups. The largest group, called a kingdom, is divided into smaller groups known as phylum, class, order, family, genus, and species.

Organisms in the same kingdom are somewhat similar to one another and are very different from organisms in the other five kingdoms. Each group in a kingdom becomes smaller and smaller until only one type of organism remains. The smallest group has only one type of organism and is called a species. Scientists use genus and species names to identify individual types of organisms.
Red Tide: A Bad Bloom at the Beach

You’re all ready for some fun and sun. But when you get to the beach, it’s closed. Then you notice that the water is a strange color. You have to put your swimsuit away. Your beach is a victim of red tide!

Red tide isn’t actually a tide. It is ocean water that is blooming with a harmful kind of algae. These one-celled organisms are poisonous to the sea creatures that eat them. The water isn’t always red, either. Sometimes it’s orange, brown, or green.

An outbreak of red tide can do a lot of damage. One outbreak on the coast of Florida killed tens of thousands of fish, crabs, birds, and other small animals within a few months. It also killed large animals like manatees, dolphins, and sea turtles. Red tides can make people sick if they eat infected shellfish.

Scientists are working to predict where and when red tides occur. They measure the amount of algae along coastlines. They use data collected from satellites to study wind speed and direction. This information helps scientists predict where blooms may develop. Scientists can then use their predictions to warn local agencies about incoming red tides.

Write About It

Infer  What might you infer about a closed beach with reddish-colored water? How could the prediction of red tides be helpful to people?
What I Know

Complete each statement about red tides.

- A red tide is _______ that is blooming with harmful _______ , _______ one-celled organisms.
- Red tides can make people sick if they _______ infected shellfish.
- A red tide in Florida killed tens of thousands of _______ animals.
- Scientists are using _______ to collect data about red tides.

What I Infer

Answer the questions by making inferences about red tides.

1. What might you infer about a closed beach with reddish-colored water?
   I might infer that the water is infected with a red tide.

2. How could the prediction of red tides be helpful to people?
   People can try to prevent red tides or they can try to protect the animals that live in the water so that people don’t get sick from eating them.
The Plant Kingdom

Use your textbook to help you fill in the blanks.

How do we classify plants?

1. We can classify plants in two groups: those with and those without roots, stems, and leaves.

2. Plants without roots, stems, or leaves are mosses (or wort plants).

How do plants get what they need?

3. Plants make their own food by using energy from sunlight.

4. Plants take in water and nutrients from the soil through their roots.

Why are leaves important?

5. Plants use energy to change carbon dioxide and water into food, called plant sugars.

6. Plants get carbon dioxide and release water through openings on the undersides of their leaves, called stomata.

7. In a process called transpiration, water exits the leaves of a plant.

8. Photosynthesis makes food energy, and respiration releases energy.
What are mosses and ferns?

9. Mosses and ferns are plants that use __________ spores ______ to reproduce.

10. A spore case protects the spore from too much ______ heat ______ or too little ______ water ______.

How do we use plants?

11. We use plants and plant parts such as bulbs, tubers, ______ leaves ______, ______ stems ______, ______ roots ______, and flowers for ______ food ______.

12. We also use plants for ______ clothing ______ and ______ medicines ______.

Critical Thinking

13. If your family could grow only one kind of plant, which plant would be best for your family to grow?

Possible answer: People have many uses for plants, including the production of food, clothing, furniture, shelter, medicine, and food.

I think it would be best for my family to grow plants for clothing, so we could make our own clothes and wear what we want.
The Plant Kingdom

Match the correct letter with the description.

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<td>d. root</td>
</tr>
<tr>
<td>b. photosynthesis</td>
<td>e. root hairs</td>
</tr>
<tr>
<td>c. respiration</td>
<td>f. spore</td>
</tr>
<tr>
<td>g. stem</td>
<td>h. stomata</td>
</tr>
<tr>
<td>i. transpiration</td>
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1. _____ g the part of a plant that carries food and nutrients to and from the roots and leaves
2. _____ f a cell in a seedless plant that can grow into a new plant
3. _____ h tiny holes found on the underside of a leaf
4. _____ c a process that breaks down food and releases energy
5. _____ e threadlike cells on a root that take in water and nutrients from the soil
6. _____ d a plant part that takes up water and nutrients from the ground and holds the plant in place
7. _____ a the thin, protective covering on a leaf that keeps water in the leaf
8. _____ b the process that a plant uses to produce plant sugars from water, carbon dioxide, and energy from sunlight
9. _____ i a process in which water exits a plant leaf
The Plant Kingdom

Fill in the blanks.

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Plants have the same needs as other living things. Plants need air, water, energy, and a place to live. Plants get the energy they need in order to grow from the food they make in their leaves.

Photosynthesis and respiration are two very important processes that happen in plants. During photosynthesis, energy is stored as plant sugars. During respiration, energy is released for use by the plant. All animals, not just plants, depend on respiration for survival. All animals also depend on the food made by plants.
How Seed Plants Reproduce

Use your textbook to help you fill in the blanks.

How do we classify seed plants?

1. Most plants that have _________ roots, _________ stems, _________, and _________ leaves produce seeds.

2. A seed is an undeveloped _________ plant inside a protective covering.

How do seeds form?

3. Pollination occurs when _________ pollen travels from the male part of the flower to the female part of the flower.

4. When the male and female sex cells join together, fertilization takes place and a _________ seed is formed.

How do seeds grow?

5. Seeds need _________ water and the right conditions in order to start growing.

6. Seeds move from place to place carried by the _________ wind, attached to an animal’s _________ fur, or passing through an animal’s _________ body and being left on the ground.
How are plants alike and different from their parents?

7. Inherited ______ traits ________ are passed on from parent plants to offspring. Examples include the shapes of leaves and the colors of flowers.

8. Using inherited traits can help ______ farmers ________ grow bigger or better plants.

What are other ways plants can reproduce?

9. Plants can reproduce in ways other than through ______ flowers ________, ______ cones ________, or ______ spores ________.

10. Examples of other ways that plants reproduce are ______ runners ________, which are stems that grow along the ground, and ______ bulbs ________ and ______ tubers ________, which grow underground.

Critical Thinking

11. If an apple is dropped in a river, will its seeds ever grow?

Possible answer: It depends on where the apple seeds end up. If the apple is eaten by an animal, the seeds could be dropped on the ground and grow. If the apple is taken out of the water, the seeds could be planted. The apple could break down on the river bank and release its seeds there. It may also break down in the water, though, and the seeds would sink to the bottom and never grow.
How Seed Plants Reproduce

What am I?

Choose a word from the word box below that answers each question.

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<th>b. germination</th>
<th>c. life cycle</th>
<th>d. ovary</th>
<th>e. pollination</th>
<th>f. reproduction</th>
<th>g. seed</th>
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1. I am the plant part that contains an undeveloped plant and a food supply inside my protective coat. What am I? _____

2. I am the process that uses flowers and fruits to make new plants. What am I? _____

3. I am the part of a flowering plant in which the eggs are made and stored. What am I? _____

4. I am the process that occurs when pollen is moved from the anther to the pistil of a flower. What am I? _____

5. I am the process that occurs when the male and female sex cells of a flower join together. What am I? _____

6. I am the ongoing life story of a type of flowering plant. What am I? _____

7. I am the process during which a seed begins to grow. What am I? _____
How Seed Plants Reproduce

Fill in the blanks.

- fertilization
- ovary
- pollination
- seed
- germinate
- pollen
- reproduction

The plant kingdom has many members. One very large group is made up of ___seed___ plants. In this type of plant, flowers, fruits, and cones are needed for ___reproduction___ . These plant parts contain male and female plant parts that produce special cells. The male cells are found in ___pollen___ on the anther of a flower. The female cells, called eggs, are found in the ___ovary___ at the base of the pistil.

Pollen can be transferred from the anther to the pistil by the wind or by another organism, such as a honeybee, through ___pollination___ . The male cells pass through a tube into the ovary and join with the eggs, a process called ___fertilization___ . Fertilization in plants forms a seed. The seeds ___germinate___ when conditions are right. The seed produces a seedling with traits inherited from its parent plant.
Dandelions and Me

Write About It

Personal Narrative  Think about a time you were sad and someone said something that made you feel better. Write a personal narrative about the event. Tell how it made you feel.

Getting Ideas

Picture the event in your mind. Jot down what happened in the chart below. Start with what happened first.

Planning and Organizing

Zoe wanted to write about the time she saw squirrels raiding the birdfeeder for sunflower seeds. Below are three sentences she wrote. Write “1” in front of the sentence that should be first. Write “2” in front of the sentence that should come next. Write “3” in front of the sentence that should be last.

2 At first, some chickadees and blue jays came to the feeder and ate the seeds.

3 After a few days, squirrels raided the feeder and carried seeds away.

1 Last spring, we filled the birdfeeder in our backyard with sunflower seeds.
Revising and Proofreading

Here is a part of Zoe’s personal narrative. Proofread it. She made six errors. Find the errors and correct them.

I laughed when I saw that Rascal of a squirrel run off with some seeds. I watched as the squirrel planted them. It would fantastic if they grew? I waited about a week. Every day, I looked to see if the seeds had sprooted. Finally, there was a little seedling, I was so excited.

Drafting

Write a sentence to begin your personal narrative. Use “I” to identify youself. Make sure your sentence will grab your readers’ attention so that they will want to read your story.

Possible answer: I never got up that early on Saturdays.

Now write the first draft of your story. Use a separate piece of paper. Remember to tell what happened in sequence and to use time-order words.

Revising and Proofreading

Now revise and proofread your writing. Ask yourself:

► Did I use the pronoun “I” to tell my story?
► Did I tell what happened in sequence?
► Did I use time-order words?
► Did I correct all of the mistakes?
Kingdoms of Life

Choose the letter of the best answer.

1. A group of cells that do the same job forms a(n)
   a. organ system.
   b. organ.
   c. cell.
   d. tissue.

5. How many basic jobs do living things perform?
   a. two
   b. three
   c. four
   d. five

2. The protective covering on a leaf is its
   a. epidermis.
   b. stomata.
   c. root hairs.
   d. seed covering.

6. A single cell that can grow into a new plant is called a
   a. spore.
   b. cone.
   c. stem.
   d. root.

3. Into how many kingdoms do scientists place organisms?
   a. five
   b. six
   c. seven
   d. eight

7. What are the threadlike cells on a root?
   a. seeds
   b. root hairs
   c. runners
   d. cuttings

4. The tiny holes on the underside of a leaf are the
   a. chlorophyll.
   b. epidermis.
   c. stomata.
   d. seeds.

8. Tissues that form a group are called a(n)
   a. organ.
   b. cell.
   c. organ system.
   d. cell wall.
Choose the letter of the best answer.

9. In which process does water exit from a leaf?
   a. fertilization
   b. pollination
   c. germination
   d. transpiration

10. The smallest group in a kingdom is called a
    a. phylum.
    b. species.
    c. order.
    d. class.

11. The process by which plants release energy from food is called
    a. transpiration.
    b. respiration.
    c. germination.
    d. pollination.

12. Which of the following do scientists use to name organisms?
    a. genus and species
    b. phylum and class
    c. family and order
    d. order and genus

13. How is a plant cell different from an animal cell?
    a. Only plant cells contain cytoplasm.
    b. Only animal cells contain a nucleus.
    c. Only plant cells contain chloroplasts.
    d. Only animal cells contain mitochondria.

14. What do scientists use to see one-celled organisms?
    a. microscope
    b. test tube
    c. balance scale
    d. tongs

15. The joining of male cells and female cells in a plant is called
    a. pollination.
    b. germination.
    c. respiration.
    d. fertilization.
The Animal Kingdom

Complete the concept about the animal kingdom.

Animals

- have a life cycle
  - metamorphosis
    - incomplete
    - complete
- have body systems
  - birth
    - growth
    - reproduction
  - excretory system
    - digestive system
  - respiratory system
  - skeletal system
  - nervous system
  - muscular system
  - circulatory system
Animals Without Backbones

Use your textbook to help you fill in the blanks.

What are invertebrates?

1. Scientists keep track of Earth’s animal species by observing their similarities and differences.

2. An animal with symmetry has body parts that match other body parts around a midpoint or line.

3. Animals can be classified by whether or not they have a(n) backbone.

4. More than 95 out every 100 animals are invertebrates.

What are some invertebrates?

5. The simplest invertebrates are sponges.

6. The shape of a sponge does not have symmetry.

7. Invertebrates that have stinging cells on their tentacles are called cnidarians.

8. Clams, squid, and snails are soft-bodied invertebrates with hard shells and are called mollusks.

9. Sea stars, sea urchins, and sand dollars are spiny-skinned invertebrates, called echinoderms.

10. All echinoderms have a support structure inside their bodies, called a(n) endoskeleton.
What are arthropods?

11. Invertebrates with jointed legs and body sections are called ____ arthropods ____.

12. Arthropods have a hard outer covering, called a(n) ____ exoskeleton ____ that protects their bodies and holds in moisture.

How are worms classified?

13. Worms are classified as flatworms, ____ roundworms ____ or ____ segmented ____ worms.

14. Flatworms have ribbon-like bodies, and some types ____ live ____ inside the bodies of other animals.

15. Roundworms have thin bodies with ____ pointed ____ ends.

Critical Thinking

16. Why do you think the first way an animal is classified is by whether it is a vertebrate or an invertebrate?

Possible answer: Vertebrates are animals with backbones, and invertebrates are animals without backbones. Backbones are easy to see. I think that scientists studied a lot of animals and found that animals with backbones had more things in common with each other than animals without backbones.
Animals Without Backbones

Choose the word from the box below that completes each sentence.

<table>
<thead>
<tr>
<th>arthropod</th>
<th>echinoderm</th>
<th>exoskeleton</th>
<th>mollusk</th>
</tr>
</thead>
<tbody>
<tr>
<td>cnidarian</td>
<td>endoskeleton</td>
<td>invertebrate</td>
<td>sponge</td>
</tr>
</tbody>
</table>

1. The hard outer covering that protects an invertebrate’s body is its ________ exoskeleton ________.

2. A spiny-skinned invertebrate, such as a sea star, is called a(n) ________ echinoderm ________.

3. A(n) ________ invertebrate is an animal without a backbone.

4. A soft-bodied invertebrate, such as a clam or snail, is called a(n) ________ mollusk ________.

5. An invertebrate with jointed legs and a sectioned body is a(n) ________ arthropod ________.

6. An internal support structure in an animal is a(n) ________ endoskeleton ________.

7. An invertebrate with poisonous stingers is a(n) ________ cnidarian ________.

8. The simplest kind of invertebrate is a(n) ________ sponge ________.
Animals Without Backbones

Fill in the blanks.

<table>
<thead>
<tr>
<th>arthropods</th>
<th>endoskeleton</th>
<th>mollusks</th>
</tr>
</thead>
<tbody>
<tr>
<td>backbone</td>
<td>exoskeleton</td>
<td>segmented</td>
</tr>
<tr>
<td>cnidarians</td>
<td>invertebrates</td>
<td>sponges</td>
</tr>
</tbody>
</table>

Scientists use various traits to classify Earth’s two million animals. One way to classify animals is as vertebrates or ________ invertebrates. Vertebrates have a(n) ________ backbone, and invertebrates do not.

Insects and arachnids are invertebrates, called ________ arthropods, that have a hard outer ________ exoskeleton. Echinoderms are invertebrates that have a(n) ________ endoskeleton inside their bodies. The simplest invertebrates are ________ sponges. Other invertebrate groups are ________ cnidarians with poisonous stingers and ________ mollusks with soft bodies protected by hard shells. The final group of invertebrates is worms: flatworms, roundworms, and ________ segmented worms. Some kinds of flatworms and roundworms live inside the bodies of other animals.
Animals With Backbones

Use your textbook to help you fill in the blanks.

What are vertebrates?

1. Vertebrates are animals that have a(n) _______ backbone _______.

2. Some vertebrates are _______ warm-blooded _______ and maintain their body temperature by breaking down food to get _______ heat (or energy) _______.

3. Some vertebrates, such as fish, amphibians, and reptiles, are _______ cold-blooded _______ and cannot keep constant body _______ temperatures _______.

4. There are seven classes of vertebrates: mammals, _______ amphibians _______, reptiles, birds, and three classes of _______ fish _______.

5. The three classes of fish are jawless fish, cartilaginous fish, and _______ bony _______ fish.

What are some other vertebrate groups?

6. A vertebrate that spends part of its life in water and part on land is called a(n) _______ amphibian _______.

7. Snakes, lizards, turtles, and crocodiles are _______ reptiles _______. They have tough, dry, scaly _______ skin _______ that holds in moisture.

8. The only animals that have feathers are _______ birds _______. Like mammals, they are also _______ warm-blooded _______.

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Chapter 2 • The Animal Kingdom

Reading and Writing

Use with Lesson 2

Animals With Backbones
What are mammals?

9. A warm-blooded vertebrate with hair or fur is a(n) ______ mammal ______. 

10. Mammals can live on land, in trees, and in ______ water ______. 

11. Most mammals give birth to live young. Only a few ______ lay eggs ______. 

12. Kangaroos, koalas, and opossums carry their young in ______ pouches ______ until they are grown. 

13. The platypus and spiny anteater are the only mammals that reproduce by ______ laying eggs ______. 

Critical Thinking 

14. Why do you think there are three separate groups of fish instead of one group for all fish?  
   Possible answer: Scientists study animals and group them by what they have in common. All fish are vertebrates, cold-blooded, and must live in water all the time. The next factor is whether or not they had a jaw and what kind of body they had: bony skeleton or cartilage. I think there are too many fish that are too different to put them all together in one group as just fish.
Animals With Backbones

What am I?
Choose a word from the word box below that answers each question.

<table>
<thead>
<tr>
<th>amphibian</th>
<th>cartilage</th>
<th>reptile</th>
<th>warm-blooded</th>
</tr>
</thead>
<tbody>
<tr>
<td>bird</td>
<td>cold-blooded</td>
<td>vertebrate</td>
<td></td>
</tr>
</tbody>
</table>

1. ___________ Animals in my group have backbones. What am I?
2. ___________ I can keep my body at a constant temperature. I do this by breaking down food to release heat. What am I?
3. ___________ My body temperature changes with the surrounding temperature. What am I?
4. ___________ I spend part of my life in water and part on land. My skin must be kept moist. What am I?
5. ___________ Snakes and lizards are part of my group. We live on land and have tough, scaly skin. What am I?
6. ___________ I have scales and feathers and hollow bones that make my body light enough to fly. What am I?
7. ___________ I am rubbery and make up skeletons in lampreys, sharks, and rays. What am I?
Animals With Backbones

Fill in the blanks.

<table>
<thead>
<tr>
<th>bony</th>
<th>invertebrates</th>
<th>surroundings</th>
</tr>
</thead>
<tbody>
<tr>
<td>cold-blooded</td>
<td>mammals</td>
<td>warm-blooded</td>
</tr>
<tr>
<td>fur</td>
<td>reptiles</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>vertebrates</td>
</tr>
</tbody>
</table>

Invertebrates are the largest group of animals on Earth.
The second-largest group is ______vertebrates______.
Vertebrates have backbones, and ______invertebrates______
do not.

Some vertebrates keep their bodies at one temperature by eating food to release heat. These animals are
______warm-blooded______ and are birds or ______mammals______.
Birds have feathers, and mammals have ______fur________
or hair. Other vertebrates are ____cold-blooded_____
and their body temperature depends on their
______surroundings______ . Cold-blooded animals are
classified as jawless fish, cartilaginous fish, ______bony______
fish, amphibians, or ______reptiles______ .
Gentle Giants

Write About It
Explanatory Writing Find out more about another endangered animal. Write a short explanation of why it is endangered.

Getting Ideas
Select an endangered animal. Use the cause-and-effect chart below. Fill it in as you do research.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>People cut down trees.</td>
<td>Lemurs lose their habitat.</td>
</tr>
<tr>
<td>People move into areas where lemurs live.</td>
<td>Lemurs lose their habitat.</td>
</tr>
<tr>
<td>People are frightened of lemurs.</td>
<td>People hunt lemurs to get rid of them.</td>
</tr>
<tr>
<td>Lemurs are hunted for food.</td>
<td>There are fewer and fewer lemurs every year.</td>
</tr>
</tbody>
</table>

Planning and Organizing
Here are some sentences that Kristen wrote about lemurs. Circle the part of the sentence that tells the cause. Underline the part that shows the effect.

1. Lemurs are losing their habitat because people cut down trees for farming.
2. Some people hunt lemurs because they are afraid of them.
3. Every year there are fewer lemurs because they are hunted for food.
Revising and Proofreading
Here is part of Kristen’s explanation. She made six capitalization mistakes. Find the mistakes and correct them.

Lemurs live on madagascar and the comoro islands. These are islands off the coast of africa. Before humans arrived, there were many species of lemurs. over time, at least fourteen species became extinct.

Drafting
Write a sentence to begin your explanation. Tell the name of the animal and your main idea about it.

Sample sentence: Unless we do something soon to protect lemurs, they will die out.

Now write your explanation. Use a separate piece of paper. Begin with your topic sentence. Include facts and details to explain how the animal became endangered. End by telling what scientists are doing to save this animal.

Revising and Proofreading
Now revise and proofread your writing. Ask yourself:

► Did I explain how the animal became endangered?
► Did I tell what scientists are doing to save it?
► Did I correct all mistakes?
Systems in Animals

Use your textbook to help you fill in the blanks.

How do animals move and sense changes?

1. The skeletal system is made of bones that protect soft body organs and work with the body’s muscular system.

2. The muscular system is made of muscles that move bones.

3. Earthworms move by shortening and stretching their muscles.

4. Sight, hearing, taste, touch, and smell are senses that help an animal detect changes in its surroundings.

5. An animal’s body systems are controlled by its nervous system.

How do air and blood travel in the body?

6. An animal gets the oxygen it needs to live through the respiratory system.

7. This system brings oxygen to the blood and removes wastes.

8. Animals take in oxygen in several ways: through their tissues, gills, or lungs.

9. The heart, blood, and blood vessels are organs that make up an animal’s circulatory system.
10. Blood is pumped by the __________ heart to all of the cells in an animal's body.

11. The bladder and kidneys are organs in the ________ excretory system that remove _________ wastes from the body.

How is food broken down?

12. Animals use food for _________ energy ________.

13. After food has been eaten, it must be _________ broken down ________ to release its nutrients.

14. The ________ digestive ________ system breaks down food.

15. The ________ stomach ________ churns and mixes food.

Critical Thinking

16. Do you think that an organism’s nervous system is affected by what it eats?

Possible answer: Yes, I think that an organism’s nervous system is affected by what it eats because all of the organ systems work together. Food enters the digestive system where it is broken down to release nutrients. Those nutrients then enter the circulatory system and are delivered to all of the cells in the body, including the nervous system.
Systems in Animals

Fill in the blank. Then circle the term in the puzzle.

1. These two systems work together to move the body.
   skeletal
   muscular

2. The brain, spinal cord, nerves, and sense organs are part of this system.
   nervous

3. Oxygen and waste gases are exchanged through this system.
   respiratory

4. The heart, blood, and blood vessels make up this system.
   circulatory

5. Any organ that removes wastes from the body is part of this system.
   excretory

6. Food is broken down to release nutrients in this system.
   digestive
Systems in Animals

Fill in the blanks.

<table>
<thead>
<tr>
<th>circulatory system</th>
<th>nervous systems</th>
<th>skeletal system</th>
</tr>
</thead>
<tbody>
<tr>
<td>excretory system</td>
<td>oxygen</td>
<td>wastes</td>
</tr>
<tr>
<td>muscular system</td>
<td>sense</td>
<td></td>
</tr>
</tbody>
</table>

An animal’s organ systems help it to meet its needs and respond to changes. The ______ nervous system ______ controls an animal’s organ systems and contains the ______ sense ______ organs that detect changes. The bones of the ______ skeletal system ______ protect the soft organs. It also works with the ______ muscular system ______ to help an animal move. The digestive system breaks down food into nutrients.

Animals need ______ oxygen ______, which comes through the respiratory system. The heart, blood, and blood vessels make up the ______ circulatory system ______. The blood carries food and oxygen to the cells, and it carries ______ wastes ______ to the ______ excretory system ______. In this system, wastes are removed by the kidneys and lungs.
Animal Life Cycles

Use your textbook to help you fill in the blanks.

What are the stages of an animal’s life?

1. Organisms go through changes in their lives, including ____________ , growth, ____________, and death.

2. A penguin chick depends on its parents for warmth, shelter, and ____________.

3. An organism’s ____________ is how long it can usually live in the wild.

What is metamorphosis?

4. The process of ____________ includes a series of separate growth stages.

5. ____________ includes separate growth stages that have changes that are hard to see.

__________ includes growth stages that are different at every stage.

How do animals reproduce?

6. All life cycles include ____________.

7. Parent animals make ____________.
8. Budding and _____ regeneration _____ are types of reproduction with one parent.

9. Organisms that reproduce with one parent produce exact copies, or __________ clones _______.

10. In two-parent reproduction, a male sperm cell and a female egg cell combine during ______ fertilization _______ and produce a(n) ______ embryo _______.

11. Traits such as eye color, height, and body color are determined by ______ heredity _______ before an organism is born.

What is inherited?

12. An ______ inherited behavior _____ is a set of actions that parents pass on to their ______ offspring _______.

Critical Thinking

13. Why do you think that different animals have different life cycles?

Possible answer: I think that animals have different life cycles because they have different traits. Insects go through their life cycle on their own. They already have the traits they need to survive and live by instinct. Birds lay eggs and protect them until they hatch. They take care of their offspring until they can survive on their own. Mammals give birth to live young and then take care of them until they become adults.
Animal Life Cycles

What am I?

Choose the letter that matches the word from the word box below to answer each question.

<table>
<thead>
<tr>
<th>a. clone</th>
<th>d. learned behavior</th>
<th>g. metamorphosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. heredity</td>
<td>e. life cycle</td>
<td></td>
</tr>
<tr>
<td>c. instinct</td>
<td>f. life span</td>
<td></td>
</tr>
</tbody>
</table>

1. I am the stages through which an organism passes, including birth and reproduction. What am I? _______e

2. I am the length of time that an organism is expected to live. What am I? _______f

3. I am the process that takes place in a series of separate growth stages. What am I? _______g

4. I am the offspring of only one parent. I am an exact copy of my parent. What am I? _______a

5. I control the traits that are passed on from parent to offspring. What am I? _______b

6. I am the behavior with which an organism is born. What am I? _______c

7. I am a behavior that an organism gains from experience. What am I? _______d
Animal Life Cycles

Fill in the blanks.

<table>
<thead>
<tr>
<th>birth</th>
<th>growth</th>
<th>metamorphosis</th>
<th>separate</th>
</tr>
</thead>
<tbody>
<tr>
<td>gradual</td>
<td>life span</td>
<td>produce</td>
<td></td>
</tr>
</tbody>
</table>

All animals go through stages that make up the life cycle. These stages include birth, growth, reproduction, and death. The amount of time an animal is expected to live is called its life span. An animal is expected to live long enough to produce offspring.

The stages of growth can be gradual or separate and different, a process called metamorphosis. The life cycle of every animal begins with birth and ends with death.
Meet Christopher Raxworthy

Read the passage in your textbook. Look for information about the Mantella poison frog and dwarf dead leaf chameleon.

Write About It

**Compare and Contrast**  How does the life cycle of the Mantella poison frog compare to the life cycle of the dwarf dead leaf chameleon?

**Compare and Contrast**

Fill in the Compare and Contrast graphic organizer. Tell how the frog and chameleon are alike and how they are different. Then, answer the question.

<table>
<thead>
<tr>
<th>Frog</th>
<th>Chameleon</th>
<th>Frog and Chameleon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Its body has vivid colors to warn predators.</td>
<td>Its body resembles a(n) dead leaf.</td>
<td>Babies hatch from eggs.</td>
</tr>
<tr>
<td>Females lay eggs in moist areas.</td>
<td>The animal hides during the day in dead leaves on the rain forest floor.</td>
<td>Frogs and Chameleons become adults in about one year.</td>
</tr>
<tr>
<td>Eggs hatch when it rains.</td>
<td>Females lay eggs in leaf litter.</td>
<td></td>
</tr>
<tr>
<td>Tadpoles move to a nearby stream.</td>
<td>Eggs hatch in ten weeks.</td>
<td></td>
</tr>
</tbody>
</table>

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**Compare and Contrast**

Read the paragraph below. Compare and contrast the work of Christopher Raxworthy and the scientists in Madagascar with that of the scientists at the San Diego National Wildlife Refuge.

**San Diego National Wildlife Refuge**

In the 1990s, the people of San Diego began working with government groups to help protect the environment. A wildlife refuge was created. The goals of the San Diego refuge include preserving endangered species and helping endangered species increase in number. The refuge protects all the wildlife native to the area, not just the endangered species. It also protects the habitats of migratory birds. The refuge provides visitors with opportunities to learn about wildlife.

**Write About It**

Write a short paragraph in which you compare and contrast the goals of Christopher Raxworthy and the other scientists in Madagascar with those of the scientists at the San Diego Refuge Complex.

Possible answer: Scientists in Madagascar and at the San Diego Refuge Complex have the same goal—to preserve natural habitats. Both groups also work to keep endangered species from becoming extinct. The refuge in San Diego also has opportunities for its visitors to learn about wildlife.
The Animal Kingdom

Circle the letter of the best answer.

1. An animal that lives part of its life in water and part of it on land is a(n)
   a. amphibian.
   b. reptile.
   c. mammal.
   d. fish.

2. What is an arthropod?
   a. an invertebrate with a spiny skin that lives in the ocean
   b. an invertebrate that remains anchored to one spot
   c. an invertebrate that lives inside the body of another animal
   d. an invertebrate with jointed legs and a body divided into sections

3. The only warm-blooded animals with a body covering of feathers are
   a. snakes.
   b. birds.
   c. mammals.
   d. fish.

4. The circulatory system is made up of the
   a. brain, spinal cord, nerves, and sensory organs.
   b. heart, blood vessels, and blood.
   c. kidneys and lungs.
   d. mouth, stomach, and digestive juices.

5. An organism that is produced by only one parent organism is called a(n)
   a. egg.
   b. embryo.
   c. clone.
   d. seed.

6. The passing of traits from parents to their offspring is known as
   a. cloning.
   b. heredity.
   c. instinct.
   d. behavior.
7. A cold-blooded animal
   a. cannot keep a constant body temperature.
   b. can keep a constant body temperature.
   c. uses the food it eats to make heat.
   d. has a short life span.

8. What is an instinct?
   a. a learned behavior
   b. a learned trait
   c. an inherited behavior
   d. an environmental trait

9. Which body system controls all of the other systems in an animal’s body?
   a. nervous system
   b. digestive system
   c. skeletal system
   d. respiratory system

10. A hard protective outer covering that keeps in moisture is a(n)
    a. endoskeleton.
    b. exoskeleton.
    c. backbone.
    d. egg.

11. If an animal’s body parts match around a midpoint or central line, that animal has
    a. endoskeleton.
    b. symmetry.
    c. exoskeleton.
    d. instinct.

12. Animals are classified as vertebrates if they
    a. do not have a backbone.
    b. have a backbone.
    c. can move.
    d. live on land.
Sea Otters: Key to the Kelp Forest
From Ranger Rick

Read the Unit Literature feature in your textbook.

Write About It

Response to Literature Research another place where plants and animals depend on each other. Write a report describing how the plants and animals interact.

Students’ reports should be written in a logical order with an introductory paragraph, details about a place where plants and animals depend on each other, a description of the relationships between the specific plants and animals in the chosen location, and a closing paragraph. Specific details of the report will vary depending on the selected location.
Exploring Ecosystems

**Ecosystems**

- contain living factors known as **biotic factors**
- can be broken down into six different **biomes**
- contain different types of organisms
- contain nonliving factors known as **abiotic factors**

**Examples of biotic factors are:**
1. plants
2. animals
3. microorganisms

**The six biomes are:**
1. grassland
2. deciduous forest
3. tropical rain forest
4. tundra
5. taiga
6. desert

**Examples of abiotic factors are:**
1. water
2. rocks
3. soil
4. sunshine
5. wind
Introduction to Ecosystems

Use your textbook to help you fill in the blanks.

What is an ecosystem?

1. The living and nonliving things in the _______environment______
   make up a(n) _______ecosystem______.

2. Plants, animals, and bacteria are living things, or
   _______biotic factors______, in an environment.

3. Water, rocks, and soil are some of the nonliving things,
   or _______abiotic factors______, in an environment.

4. Ecosystems can be large or _______small______.

5. An important abiotic factor in an ecosystem is
   its _______climate______, the typical weather pattern
   in an environment.

6. Living things in an ecosystem _______depend______
   on nonliving things to survive.

7. The place in an ecosystem in which each organism lives
   is that organism’s _______habitat______.

8. Different ecosystems have _______different______
   types of habitats.

9. To lay its eggs, a frog depends on the
   _______water______ in a pond.
What are populations and communities?

10. Ecosystems have different __________ populations __________ of species.

11. All of the populations in an ecosystem make up a(n) __________ community __________.

12. When scientists want to know about a(n) __________ ecosystem __________, they look at its populations and communities.

13. Warm and moist ecosystems usually have larger communities than __________ cold __________ and __________ dry __________ ecosystems.

Critical Thinking

14. What do you think is the most important factor affecting the size of a community in an ecosystem?

Possible answer: The amount of food, shelter, light, and the type of climate affect the size of a community in an ecosystem. I think the most important factor is light. Plants can make food if they have light, and animals can eat those plants or eat other animals that eat those plants. If there isn’t enough light, plants won’t survive and neither will anything else.
Introduction to Ecosystems

Read each definition. Write the term in the blank and fill in the crossword puzzle.

**Across**

1. all the members of a species in an ecosystem ________

4. all of the populations in an ecosystem ________

5. a living thing’s place to live in an ecosystem ________

7. an important abiotic factor in all ecosystems ________

**Down**

2. the nonliving factors of an ecosystem, such as rocks ________

3. all the living and nonliving things in an environment ________

6. the living factors of an ecosystem, such as plants ________

**Crossword Puzzle**

1. POPULATION

3. E B

4. COMMUNITY

5. HABITAT

6. CLIMATE

7. ST E M

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**Introduction to Ecosystems**

Fill in the blanks.

<table>
<thead>
<tr>
<th>abiotic factors</th>
<th>climates</th>
<th>habitats</th>
</tr>
</thead>
<tbody>
<tr>
<td>bacteria</td>
<td>dry</td>
<td>small</td>
</tr>
<tr>
<td>biotic factors</td>
<td>ecosystem</td>
<td></td>
</tr>
</tbody>
</table>

All of the living and nonliving things in an area make up the environment. An environment’s living things, such as plants, animals, and **bacteria**, are called **biotic factors**. Nonliving things, such as water, rocks, and soil, are called **abiotic factors**.

The biotic and abiotic factors in an environment work together to form a(n) **ecosystem**.

Ecosystems can be large or **small**. They can also have very different **climates**. Some ecosystems are hot and **dry**, and others are cold and wet. Different ecosystems have **habitats** that are suited to different types of living things. For example, a desert community is suited to cacti and lizards.
Biomes

Use your textbook to help you fill in the blanks.

What is a biome?

1. A large ecosystem with a unique set of characteristics is called a(n) ________ ________.

2. Biomes have distinct patterns of ________ ________ and ________ _________. Some biomes stretch across an entire ________ _________.

What are grasslands and forests?

3. A biome whose plant life includes mostly grasses growing in its ________ ________ soil is a(n) ________ ________.

4. During hot, dry summers, ________ ________ burn, and this produces rich soil for farming.

5. Oaks, maples, and hickories in the ________ ________ forests lose their leaves each year.

6. The ________ ________ is a hot and humid biome with plenty of rainfall.

What are deserts, taiga, and tundra?

7. Black bears live in the ________ ________, the largest biome in the world.

8. Cacti and yucca survive in the ________ ________ where there is very little ________ _________.

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9. The tundra is home to mammals that ______ hibernate through the winter and plants that grow close to the frozen ______ ground .

Are there water biomes?
10. Water ______ ecosystems are grouped differently from land biomes.

11. Freshwater ecosystems include lakes, ponds, rivers, ______ streams , and some ______ wetlands .

12. Saltwater ecosystems include ______ oceans , and ______ estuaries where freshwater and saltwater ecosystems meet.

Critical Thinking
13. Why do you think so many different organisms live in the tropical rain forest?

Possible answer: I think so many different organisms live there ______ because tropical rain forests have three different parts: the ______ canopy, the understory, and the forest floor. Plants that need a lot of light and animals that can climb high live in the canopy. Orchids, butterflies, frogs and snakes live in the understory. Insects, spiders, and plants that don’t need a lot of light live on the forest floor. The tropical rain forests are also warm all year round ______ and get a lot of rain.
Biomes

Match the correct word with its description.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>biome</td>
</tr>
<tr>
<td>b.</td>
<td>deciduous forest</td>
</tr>
<tr>
<td>c.</td>
<td>desert</td>
</tr>
<tr>
<td>d.</td>
<td>grassland</td>
</tr>
<tr>
<td>e.</td>
<td>taiga</td>
</tr>
<tr>
<td>f.</td>
<td>tropical rain forest</td>
</tr>
<tr>
<td>g.</td>
<td>tundra</td>
</tr>
</tbody>
</table>

1. _______ This is a large ecosystem that has its own special plants, animals, soil, and climate.
2. _______ This is a biome, such as a prairie, that has fertile soil and some, but not much, rainfall.
3. _______ Many trees in this biome lose their leaves every year in autumn.
4. _______ This biome is located near the equator. It is hot and humid year round. It is home to a large variety of plants and animals.
5. _______ Earth’s northern regions are the location of this forest biome. Its plant life includes conifers, lichens, and mosses.
6. _______ This dry biome gets little rain.
7. _______ The ground is frozen year round in this cold, dry biome.
Biomes

Fill in the blanks.

<table>
<thead>
<tr>
<th>biomes</th>
<th>dry</th>
<th>taiga</th>
</tr>
</thead>
<tbody>
<tr>
<td>characteristics</td>
<td>harsh</td>
<td>tropical rain forest</td>
</tr>
<tr>
<td>cold</td>
<td>organisms</td>
<td></td>
</tr>
<tr>
<td>deciduous forest</td>
<td>populations</td>
<td></td>
</tr>
</tbody>
</table>

Earth has six major ecosystems. These ecosystems, also known as ______ biomes, have their own ______ characteristics, including temperature, precipitation, and soil. Each biome also has a special community made up of different ______ populations of plants and animals.

The ______ deciduous forest has trees that lose their leaves each autumn. The ______ tropical rain forest has a climate suitable to the greatest variety of ______ organisms. Other biomes have ______ harsh climates. The ______ taiga and tundra have very ______ cold environments. Deserts have very ______ dry environments. There are fewer plants and animals in these three biomes.
Museum Mail Call

Read the selection from your textbook. Look for information about how building affects an ecosystem. On a separate piece of paper, write the sentences that state facts about the mangrove swamp.

Write About It

Draw Conclusions What might happen to the plants and animals of Florida’s wetlands if people continue to build there?

Fill in the Draw Conclusions graphic organizer about the mangrove swamp.

<table>
<thead>
<tr>
<th>My Prediction</th>
<th>What Happens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many mangroves are being replaced by stores, __________ homes, and parking lots.</td>
<td>Cutting down the mangroves will change the environment.</td>
</tr>
<tr>
<td>The mangroves are home to many __________ animals.</td>
<td>Loss of the mangroves will affect the population of the ecosystem.</td>
</tr>
<tr>
<td>Mangrove roots provide shelter for __________ fish and shrimp.</td>
<td>Animals will have to find a new habitat, and some species may not survive.</td>
</tr>
<tr>
<td>The mangroves protect the __________ coast from wind, waves, and floods.</td>
<td>The coast will not be protected from winds, waves, and floods.</td>
</tr>
</tbody>
</table>
Reread Tommy’s message. If you were one of the museum’s scientists, how would Tommy’s note help you? What would you and other museum scientists do to keep the mangroves safe? How would you protect the plants and animals that live in the mangroves? Write an informative response to Tommy and answer his question.

TO: Tommy  
FROM: American Museum of Natural History  
SUBJECT: Save the Mangroves!  

Dear Tommy,

Possible answer: Thank you for writing to the American Museum of Natural History. We need stories from people around the world so that we can learn about their environments. When neighborhoods are built in an ecosystem, they destroy many natural habitats. Most of the animals have to move to find shelter, food, and water. Unfortunately, most of them do not survive. We are trying to move the animals and plants to a protected environment. We are also trying to limit the amount of construction that can be done in a particular area. We hope that answers your question.

Sincerely,

Museum Scientists
Relationships in Ecosystems

Use your textbook to help you fill in the blanks.

How do organisms depend on one another?

1. Organisms in an ecosystem depend on producers for energy (or food).
2. Plants are producers that make food using energy from sunlight.
3. Energy moves from producers to consumers, organisms that need to eat other organisms for energy.
4. The three types of consumers are herbivores, which eat only plants, carnivores which eat only other animals, and omnivores which eat both plants and animals.
5. Ecosystems also have organisms, called decomposers, that break down and recycle plant and animal remains.

What is a food chain?

6. The order in which energy passes through organisms in an ecosystem is called a(n) food chain.
7. Algae and green plants are first in a pond food chain.
8. Bacteria and other decomposers break down dead organisms.
What is a food web?

9. Food chains in an ecosystem are connected in a(n) ________ food web.

10. Food webs show the relationships between ________ predators, which are organisms that hunt for food, and ________ prey, which are organisms that are hunted.

11. Plants in a food web compete for ________ sunlight and ________ nutrients.

What is an energy pyramid?

12. Energy in an ecosystem travels from the producers to the ________ herbivores and then to the omnivores and carnivores.

13. A model of how much energy there is in an ecosystem is called a(n) ________ energy pyramid.

Critical Thinking

14. Where do you think decomposers fit into the energy pyramid?

Possible answer: I think that decomposers fit into the energy pyramid at every level, because they break down dead and decaying matter at every level of the food chain. That is how they get their energy, and that is how they return nutrients to the ecosystem for all other organisms.
Relationships in Ecosystems

What am I?

Choose a word from the word box below that answers each question.

| a. competition | d. energy pyramid | g. producer |
| b. consumer    | e. food chain     | c. decomposer |
| f. food web    |                   |              |

1. _____ g I am a living thing that can use energy from the Sun to make food. What am I?

2. _____ b I am a living thing that must use other organisms as food to get energy. What am I?

3. _____ c I am an organism that breaks down and recycles the remains of dead organisms in an ecosystem. What am I?

4. _____ e I show the order, or sequence, in which organisms in an ecosystem consume one another. What am I?

5. _____ a I am the struggle that takes place among organisms for food, water, and other things needed to live. What am I?

6. _____ f I am formed when food chains are linked together. What am I?

7. _____ d I show how much energy there is at each step of a food chain in an ecosystem. What am I?
Relationships in Ecosystems

Fill in the blanks.

<table>
<thead>
<tr>
<th>carnivores</th>
<th>energy pyramid</th>
<th>groups</th>
<th>producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>competition</td>
<td>food chain</td>
<td>live</td>
<td></td>
</tr>
<tr>
<td>decomposers</td>
<td>food web</td>
<td>organisms</td>
<td></td>
</tr>
</tbody>
</table>

An ecosystem is a community of organisms that are in ______ competition with each other for limited amounts of water, food, energy, and space.

Members of an ecosystem can be sorted into three main groups: ______ producers, consumers, and ______ decomposers. The order, or sequence, in which ______ organisms eat one another is called a(n) ______ food chain. Different food chains can be connected to form a(n) ______ food web.

Energy moves through an ecosystem from plants to herbivores and then to ______ carnivores. An energy pyramid shows how energy is used in an ecosystem. Without producers, consumers could not ______ live.
The Moth that Needed the Tree

Write About It

Expository Writing Research another example of how insects and plants depend on each other. Write a report with facts and details from your research.

Getting Ideas

Think about what you learned in this chapter and through your research. Fill in the chart below. Tell the main idea and two details about yucca trees and yucca moths.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yucca trees and yucca moths depend on each other.</td>
<td>Moths help the trees reproduce by carrying pollen from tree to tree.</td>
</tr>
<tr>
<td></td>
<td>The yucca's seeds are food for the hatched larvae.</td>
</tr>
</tbody>
</table>

Planning and Organizing

Mireya wrote three sentences. Write “Main Idea” next to the sentence that tells the main idea. Write “Detail” next to each sentence that tells a detail.

1. ___________ In spring, yucca moths crawl out of their cocoons.
2. ___________ The yucca moth and yucca tree need each other to live.
3. ___________ Female moths gather pollen from the yucca tree.
Revising and Proofreading

Mireya wrote some sentences. She did not include many details. Choose a word or set of numerals from the box. Write it on the line.

| 3-5 | black | few | 8-10 |

A yucca moth is about \textbf{8-10} mm long. Its color is \textbf{black}. In only a \textbf{few} days, the female moth places about \textbf{3-5} eggs in a yucca flower’s ovary.

Drafting

Begin your report. Start with a topic sentence. Tell the main idea of your report.

Sample sentence: The yucca moth and the yucca tree need each other.

Now write your report. Use a separate piece of paper. Start with the sentence you wrote above. Include facts and details about the yucca tree and the yucca moth. At the end of your report, draw a conclusion about how they help each other.

Revising and Proofreading

Now revise and proofread your writing. Ask yourself:

- Did I include facts and details?
- Did I draw a conclusion at the end of the report?
- Did I correct all mistakes?
Exploring Ecosystems

Circle the letter of the best answer.

1. Water, rocks, and other nonliving things in an environment are called
   a. biotic factors.
   b. abiotic factors.
   c. a population.
   d. an ecosystem.

2. What do all of the living and nonliving things in an environment make up?
   a. a species
   b. a population
   c. an ecosystem
   d. a community

3. Each plant and animal in an ecosystem has its own place to live. That is the organism’s
   a. habitat.
   b. location.
   c. biome.
   d. abiotic factor.

4. All of the barrel cacti in a desert make up a group of organisms called a(n)
   a. ecosystem.
   b. population.
   c. community.
   d. habitat.

5. All of the cacti, insects, birds, and lizards in the desert are part of the desert
   a. habitat.
   b. population.
   c. community.
   d. producers.

6. The living things in an environment are called
   a. biotic factors.
   b. abiotic factors.
   c. a population.
   d. an ecosystem.

7. What is the name for the six major ecosystems on Earth?
   a. biomes
   b. biotic factors
   c. abiotic factors
   d. ecology
Circle the letter of the best answer.

8. Which biome has different types of trees, most of which lose their leaves in the autumn?
   a. desert
   b. tundra
   c. tropical rain forest
   d. deciduous forest

9. Which hot, humid biome is located near Earth’s equator?
   a. desert
   b. tundra
   c. tropical rain forest
   d. deciduous forest

10. Which of the following biomes has the driest climate?
    a. desert
    b. deciduous forest
    c. grassland
    d. taiga

11. Which of these makes food in an ecosystem?
    a. producers
    b. consumers
    c. decomposers
    d. herbivores

12. Which statement best describes a consumer?
    a. Consumers make their own food.
    b. Consumers cannot make their own food.
    c. Consumers get energy from the Sun.
    d. Consumers recycle the remains of dead organisms.

13. The struggle among organisms for food, water, and other needs is called
    a. competition.
    b. a food web.
    c. a food chain.
    d. a predator.

14. What relationship is shown below?
    a. food web
    b. food chain
    c. energy pyramid
    d. food pyramid
## Changes in Ecosystems

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Events</td>
<td>➤ short-term changes, like the change of seasons</td>
</tr>
<tr>
<td></td>
<td>➤ long-term changes that result from a(n) hurricane or the eruption of a(n) volcano</td>
</tr>
<tr>
<td>Living Things</td>
<td>➤ harmful changes, like insects eating crops</td>
</tr>
<tr>
<td></td>
<td>➤ helpful changes, like insects pollinating flowers</td>
</tr>
<tr>
<td>People</td>
<td>➤ helpful changes, like protecting the environment</td>
</tr>
<tr>
<td></td>
<td>➤ harmful changes, like pollution, overpopulation, and endangering living things</td>
</tr>
</tbody>
</table>
Animal Adaptations

Use your textbook to help you fill in the blanks.

What are adaptations?

1. Survival is not easy for organisms, because each ecosystem has special __________ challenges.

2. Organisms have traits or __________ adaptations that help them survive in their environments.

3. A bird’s beak and a camel’s hump are two examples of adaptations that help animals to _______ survive _______.

4. Organisms that live in hot desert ecosystems have adaptations for staying __________ cool and __________ water.

5. The fennec fox has large ears that give off __________ heat and thin __________ fur that helps it stay cool.

6. Kangaroo rats survive in the desert because they get water from the __________ food they eat.

7. Camels have humps to store fat for __________ energy, and they have __________ hooves to walk on sand.

What are some other adaptations of animals?

8. Animals living in different __________ environments have different adaptations.
LESSON 9.

Some animals have adaptations, like the ________ **spines** on a hedgehog, to protect themselves from ________ **predators**.

10. Some animals survive because they blend in with the colors and shapes in their environments, an adaptation called ________ **camouflage**.

11. Hover flies and scarlet king snakes can survive because they look like other, more dangerous organisms, an adaptation called ________ **mimicry**.

12. Animals can avoid cold winters by ________ **hibernating** or resting until the weather gets warmer.

**How else do animals survive?**

13. Living things ________ **interact** in harmful and ________ **helpful** ways.

**Critical Thinking**

14. What kinds of adaptations do the Egyptian plover and the Nile crocodile have?

Possible answer: Adaptations are traits that help animals survive in their environments. The Egyptian plover picks leeches out of the mouths of the Nile crocodile. The Egyptian plover has a long, hard, sharp beak and fast wings. The Nile crocodile has a wide mouth, hard tongue, and thick gums.
Animal Adaptations

Choose a word from the word box below that correctly fills in the blank.

adaptation  hibernate  mimicry  traits

camouflage  migrate  survive

1. Animals have adaptations that help them ________ survive in their ecosystem.
2. Some organisms “copy” the traits of other living things in their environment. This adaptation is called ________ mimicry ________.
3. Organisms have ________ traits ________ that help them survive in their environments.
4. Any trait that helps an organism survive in its environment is called a(n) ________ adaptation ________.
5. Some animals periodically ________ migrate ________ to different locations for warmer weather.
6. The fur of an arctic fox changes color so it can blend into its environment. This adaptation is called ________ camouflage ________.
7. Some animals survive the cold winter because they are able to remain completely still for a long period of time, or ________ hibernate ________.
Animal Adaptations

Fill in the blanks.

<table>
<thead>
<tr>
<th>adaptations</th>
<th>behavior</th>
<th>challenges</th>
<th>different</th>
<th>predators</th>
</tr>
</thead>
<tbody>
<tr>
<td>avoid</td>
<td>camouflage</td>
<td>colors</td>
<td>mimicry</td>
<td>survive</td>
</tr>
</tbody>
</table>

All ecosystems present challenges to the organisms that live there. Living things have different adaptations that make them better suited to the challenges in their environments and help them survive.

Survival in different environments requires different adaptations. An organism with camouflage can hide from predators because it blends in with the colors and shapes of its environment. An organism that has mimicry is copying the physical traits and behavior of other organisms that predators usually avoid. Different animals have different adaptations and different behaviors, but all of them have the same goal—survival.
Plants and Their Surroundings

Use your textbook to help you fill in the blanks.

How do plants respond to their environments?

1. Plants respond to changes in their ________ environment in many different ways.

2. Something in the environment that causes a living thing to react is called a(n) ________ stimulus.

3. The response of a plant to a stimulus is called a(n) ________ tropism.

4. A plant responds to a stimulus by changing its ________ direction or ________ pattern of growth.

5. Plant stems that grow upward, ________ toward a source of light, and plant ________ roots that grow toward a source of water are tropisms.

6. Plant roots also grow downward, in the direction of the pull of ________ gravity.

7. The green ________ stems of plants grow ________ upward, away from gravity.

What are some plant adaptations?

8. Like animals, plants have ________ adaptations for various environments.
9. A cactus in the desert has adaptations for conserving water, such as spongy tissue inside and a thick, waxy outer cover.

10. Some trees lose their leaves every winter.

11. The trees live on stored food until spring, when new leaves grow and the tree begins making food again.

Critical Thinking

12. What do you think would happen to trees if their leaves did not fall off before winter?

Possible answer: I think the entire tree would freeze and die. In warm weather, the roots take in water and send it up to the leaves, where it is used for photosynthesis. The leaves use the water to make food that gets transported throughout the plant. If the leaves did not fall off, then water in the leaves might freeze and kill the leaves, stems, and maybe even the trunk and the roots. When the leaves fall off, the trees live on stored food until spring.
Plants and Their Surroundings

Match the correct word with the description.

<table>
<thead>
<tr>
<th>adaptation</th>
<th>light</th>
<th>tropism</th>
<th>water</th>
</tr>
</thead>
<tbody>
<tr>
<td>energy</td>
<td>stimulus</td>
<td>upward</td>
<td></td>
</tr>
</tbody>
</table>

1. A tree that loses its leaves in the fall survives during the winter by living on stored food for _______ energy _______.

2. A cactus has spongy tissue inside for storage and a very thick, waxy skin on the outside to prevent loss of _______ water _______.

3. A trait that helps a plant survive in its environment is called a(n) _______ adaptation _______.

4. Anything in the environment that causes a plant to react, such as chemicals, heat, gravity, or water, is called a(n) _______ stimulus _______.

5. The reaction of plants to any stimulus is called _______ tropism _______.

6. Some stimuli that affect plants are chemicals, heat, gravity, water, and _______ light _______.

7. A plant responds to gravity in two ways: its roots grow downward, and its green stems grow _______ upward _______.

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Chapter 4 • Surviving in Ecosystems
Reading and Writing

Use with Lesson 2
Plants and Their Surroundings

Page 75
Plants and Their Surroundings

Fill in the blanks.

| adaptations | leaves | stimulus |
| direction | light | tropisms |
| ecosystem | photosynthesizing | water |
| food | respond |

Plants, like animals, have traits that help them to survive in their environments. Plants in a desert ______ ecosystem ______ have ______ adaptations ______ for storing ______ water ______. Deciduous trees lose their ______ leaves ______ in the fall. They live on stored ______ food ______ until the leaves grow back in the spring and start ______ photosynthesizing ______.

Plants cannot move, but they can ______ respond ______ to stimuli. All plant responses are called ______ tropisms ______. A plant can react to a(n) ______ stimulus ______ by changing its ______ direction ______ or pattern of growth. Plant roots respond to water, and plant stems respond to ______ light ______ sources. Plant roots also respond to the pull of gravity.
A Field of Sun

**Write About It**

**Descriptive Writing** Do some research about another plant. Write a description of how this plant reacts to its environment.

**Getting Ideas**

First, choose a plant. Write its name in the center circle in the web below. Do some research. Write details you find about this plant in the outer circles.

![Diagram](image)

**Planning and Organizing**

Alberto decided to describe the saguaro cactus. Here are some sentences he wrote. Identify the sense to which the details in the sentence appeal. The five senses are sight, hearing, taste, smell, and touch.

1. ________ touch ________
   The saguaro cactus has a smooth, waxy skin.

2. ________ sight ________
   It has pretty white flowers with yellow centers.

3. ________ taste ________
   The cactus makes a sweet nectar.
Drafting
Write a sentence to begin your description. Tell what plant you are writing about.

Sample sentence: The saguaro cactus stood alone in the hot desert.

Now write your description. Use a separate piece of paper. Begin with the sentence you wrote above. Use vivid details and sensory words to describe the plant.

Revising and Proofreading
Here is part of Alberto’s description. He left out some sensory words. Choose words from the box or pick your own. Write them in the blanks.

hot    massive    spiny    white

The saguaro cactus stood alone in the middle of the hot desert. Its long spiny arms seemed to reach for the Sun. Its massive stem was about 20 inches in diameter. Its beautiful white flowers waited for the Sun to go down. Then they bloomed.

Now revise and proofread your writing. Ask yourself:
► Did I describe how a plant responds to the Sun?
► Did I include details and sensory words?
► Did I correct all mistakes?
Changes in Ecosystems

Use your textbook to help you fill in the blanks.

What causes an ecosystem to change?

1. Ecosystems do not remain the same. They are always __________ changing.

2. In most ecosystems, change is part of a natural __________ pattern.

3. Some changes are long lasting, such as those caused by a volcano, hurricane, landslide (or drought), or fire.

4. Living things can change a(n) __________ ecosystem. Some living things have a __________ helpful effect while others can be harmful.

How do people change ecosystems?

5. Some changes that people make to ecosystems are helpful, while others can __________ harm an ecosystem.

6. Building roads, homes, and shopping malls affects an ecosystem by destroying the __________ habitats of living things.

7. Some examples of how people harm ecosystems are __________ deforestation, overpopulation, and __________ pollution.
What happens when ecosystems change?

8. Some living things survive changes by changing their behaviors and habits.

9. An individual organism’s response to changes is called accommodation.

10. When a species cannot adapt and most of its members have died, the species is endangered. When no members are left, the species is extinct.

How can people prevent extinction?

11. Scientists try to keep animals such as panda bears from becoming extinct by preserving land where they are protected.

Critical Thinking

12. Why do you think birds and other small animals might move to an alligator hole even if an alligator might eat them?

Possible answer: A living thing depends on the other living things and the nonliving things in its ecosystem. I think that small animals might move to an alligator hole because they have to get water. Even if the alligator eats a few of them, most of them will survive. I think there also may be some animals that help the alligator, just as the plover birds help the Nile crocodiles.
Changes in Ecosystems

What am I?

Choose a word from the word box below that answers each question.

a. accommodation  c. endangered  e. overpopulation
b. deforestation  d. extinction  f. pollution

1. _____ c I am the name for a species that only has a small number of members left alive and is in danger of dying out. What am I?

2. _____ f I am the result when toxic gas, acid rain, and fertilizers affect an ecosystem. I make the air, land, or water in an ecosystem dirty and unsafe. What am I?

3. _____ b I am what happens when a forest is cut down to make room for roads and buildings. What am I?

4. _____ e I am the result of more and more living things moving into an ecosystem, taking up more space, and using more natural resources. What am I?

5. _____ d I am what happens to an entire species when its last member dies. What am I?

6. _____ a I am the ability of some living things to survive changes in an ecosystem by changing their behavior and habits. What am I?
**Changes in Ecosystems**

Fill in the blanks.

<table>
<thead>
<tr>
<th>accommodation</th>
<th>helpful</th>
<th>pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>adapt</td>
<td>hurricane</td>
<td>protecting</td>
</tr>
<tr>
<td>harmful</td>
<td>natural</td>
<td>short term</td>
</tr>
</tbody>
</table>

Environments are always changing. An ecosystem can be changed by ____________ events, like a volcano, drought, or ____________ . These changes can be ____________ or long lasting.

Living things can also affect ecosystems. Swarms of locusts have a ____________ effect, but alligators can have a ____________ effect.

People can harm an ecosystem with ____________ , or help it by ____________ its resources.

When organisms’ ecosystems are changed, they survive by changing their habits and behaviors through ____________ . If a species cannot ____________ , its members die out. If a lot of members die out, the species is endangered. If all of the members die out, then the species is extinct.
Mail Call

In your textbook, read the letter Clara wrote to the museum scientists. Write the sentence that describes the sudden event that caused the change in the chaparral.

In August, a lightning storm started a wildfire in the chaparral.

Write the sentences that Clara uses to describe the changes in the chaparral.

1. I saw gray ashes and dead shrubs.
2. There are fields of wildflowers blooming everywhere.
3. I found a hillside monkey flower and a scarlet larkspur.
4. The birds and animals are back, too. I saw cactus wrens and jackrabbits.

Write About It

Predict  Read the letter again. Predict what the chaparral will be like next year. What might happen to the environment if there is a drought? Write your predictions in the form of a paragraph.
## Predict

Complete the graphic organizer below. Given the predictions shown, tell what you think will happen.

<table>
<thead>
<tr>
<th>Prediction</th>
<th>What Will Happen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Another drought will occur in southern California during the summer.</td>
<td>The chaparral will become hot and dry.</td>
</tr>
<tr>
<td>Another wildfire will occur in the chaparral environment next year because of the lack of rain in the summer.</td>
<td>Burned shrubs and ashes will remain, but within a year, animals, insects, and plants will have returned to the chaparral.</td>
</tr>
<tr>
<td>Seeds from monkey flower and scarlet larkspur will burn in the wildfires.</td>
<td>Monkey flower and scarlet larkspur seeds will sprout and produce more wildflowers.</td>
</tr>
<tr>
<td>Fields of wildflowers will grow.</td>
<td>Birds, animals, and honeybees will return.</td>
</tr>
<tr>
<td>Shrubs and bushes will grow.</td>
<td>Jackrabbits and cactus wren will return.</td>
</tr>
</tbody>
</table>

Now, write a paragraph describing what might happen if a drought were to affect the chaparral next year.

Possible answer: If there is another drought in the chaparral next year, I predict that lightning will cause a wildfire that will burn the chaparral again. Only burnt shrubs and ashes will remain. Within a year, certain types of wildflowers, insects, and animals will return to the chaparral environment.
Surviving in Ecosystems

Circle the letter of the best answer.

1. An adaptation that allows an organism to blend into the colors and shapes of its environment is called
   a. accommodation.
   b. hibernation.
   c. mimicry.
   d. camouflage.

2. The roots of a plant grow downward in response to what abiotic factor?
   a. nutrients
   b. gravity
   c. sunlight
   d. soil

3. The response of a plant to a ___ is called tropism.
   a. reaction
   b. growth
   c. dehydration
   d. stimulus

4. Some animals survive the cold winter by ___, saving energy by remaining completely still for a long period of time.
   a. hibernating
   b. accommodating
   c. stimulating
   d. camouflaging

5. When an entire forest is cut down to build roads or buildings, it is called
   a. accommodation.
   b. adaptation.
   c. deforestation.
   d. deconstruction.

6. Some organisms survive because they can ___ or look like other, more dangerous organisms in their environment.
   a. respond
   b. mimic
   c. camouflage
   d. accommodate
Circle the letter of the best answer.

7. A green plant will grow toward the source of this stimulus because the plant needs it in order to make food.
   a. The stimulus is gravity.
   b. The stimulus is water.
   c. The stimulus is light.
   d. The stimulus is noise.

8. Some animals survive a change in their environment by changing their behaviors or habits. This is called
   a. accommodation.
   b. adaptation.
   c. adjustment.
   d. acceptance.

9. A species is ____ when all of its members have died.
   a. environmental
   b. endangered
   c. in the ecosystem
   d. extinct

10. When more organisms move into an ecosystem and use more resources, the result is
    a. overpopulation.
    b. overcrowding.
    c. accommodation.
    d. adjustment.

11. A species is ____ when only a small number of its kind are left.
    a. environmental
    b. endangered
    c. in the ecosystem
    d. extinct

12. Any harmful substance that enters the air, water, or land can cause
    a. overcrowding.
    b. pollution.
    c. extinction.
    d. danger.

13. A trait that helps an organism survive in its environment is
    a. an adaptation.
    b. a reaction.
    c. an accommodation.
    d. a stimulus.
Lichen: Life on the Rocks
From Ranger Rick

Read the Unit Literature feature in your textbook.

Write About It
Response to Literature  This article tells you that lichen is not one thing but two. What are the two parts of a lichen? How can a lichen change rocks? Write a summary. Use your own words to explain what this article is about.

Possible answer: The two parts of a lichen are an alga and a fungus. Lichens change rocks by growing on them and by making it easier for other things to grow in them. Lichens can grow on bare rocks by first forming a crust on the rock. Lichens grow very slowly, but they give off acid that forms tiny cracks in the rock. Water fills the tiny cracks and then freezes. This causes the cracks to widen. Then soil gets in, plants take root, and after many years, the rock is covered with plants.
Shaping Earth

Complete the concept map about how Earth is shaped by different events. On each line, write an example of how that term shapes Earth.

weathering
- water freezing in rocks;
- minerals in rocks changing to other minerals

plate movement
- earthquakes
- volcanoes

people
- careless fires
- stripped forests

storms
- tornadoes
- hurricanes
Earth

Use your textbook to help you fill in the blanks.

What does Earth’s land look like?

1. A physical feature of the land is called a(n) _________ landform.
2. The tallest of all landforms are _________ mountains.
3. Vast areas of land without mountains or hills are called _________ plains.
4. Valleys and canyons are examples of landforms shaped by _________ water.
5. Mounds, called _________ sand dunes, form where wind blows sand.

What does it look like where water meets land?

6. The gently sloping edge of a continent that connects the shore to the sea is a _________ continental shelf.
7. Underwater mountains that run through an ocean form a(n) _________ ocean ridge.
8. Features that look like canyons in the ocean floor are called _________ trenches.
9. The name of a region of land where water drains into a river is a _________ drainage basin.
LESSON

Outline

10. The movement of a river slows down as it nears the ocean, dropping deposits that form triangle-shaped landforms, called _____________.

What is below Earth’s surface?

11. The outermost layer of Earth is made up of rock, called the _____________.

12. Below the crust lies a layer of rock, called the _____________.

13. Rock in the mantle can move or slowly flow because of great pressure and high _________.

14. The outer core is below the mantle and is made mostly of melted _____________.

15. The sphere of solid material at Earth’s center is called the _____________.

Critical Thinking

16. Do you think wind, water, or the Earth itself was the last factor to affect the landform where you live?

Possible answer: Mountains, volcanoes, and plains are formed by the Earth itself. Valleys, deltas, and basins are formed by flowing water. Wind, by itself, forms sand dunes, and with water, can change the shape of other landforms. Since I live in a valley, I think that water was the last factor to affect it.
Earth

Match the correct letter with the description.

<table>
<thead>
<tr>
<th>a. continental shelf</th>
<th>d. drainage basin</th>
<th>g. outer core</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. continental slope</td>
<td>e. inner core</td>
<td>h. plain</td>
</tr>
<tr>
<td>c. crust</td>
<td>f. mantle</td>
<td></td>
</tr>
</tbody>
</table>

1. ______ g    a layer of Earth that is probably made of melted iron
2. ______ d    a region of land with water that runs into a river
3. ______ c    solid rock that makes up Earth’s outermost layer
4. ______ b    the area where the edge of a continent falls steeply to the ocean floor
5. ______ f    the solid layer of Earth that can flow because of great heat and pressure
6. ______ e    the sphere of solid material at Earth’s center
7. ______ a    the underwater edge of a continent
8. ______ h    very flat land
Earth

Fill in the blanks.

continental shelf  inner core  mountains
continental slope  landforms  outer core
crust  mantle  plains

Earth is made of layers. The outermost layer of Earth is the crust. Under this layer is the mantle. Below this layer is melted iron, called the outer core. At the center of Earth, a solid mass exists called the inner core.

Earth’s largest land masses are the seven continents. When a continent touches an ocean, it slopes into the ocean and forms a continental shelf. As the continent moves farther into the ocean, it becomes steeper and forms a second feature, called a continental slope.

On land, features called landforms change the flatness of the land. These landforms include mountains and plains. The crust contains all of the features that rise from Earth’s surface and form the ocean floor.
The Moving Crust

Use your textbook to help you fill in the blanks.

What distorts Earth’s crust?

1. The large sections that make up Earth’s crust and upper mantle are called ____________plates________________.

2. When plates slowly ram into each other, they can form bended rock layers, called ____________folds________________.

3. A long, narrow crack in Earth’s crust is called a(n) ____________fault________________.

4. Tall landforms caused by folding or faulting are called ____________mountains________________.

What causes earthquakes?

5. If the rock in Earth’s crust suddenly shakes, a(n) ____________earthquake________________ occurs.

6. Underwater earthquakes can cause huge ocean waves, called ____________tsunamis________________.

How do scientists study earthquakes?

7. The source of an earthquake creates ____________seismic________________ waves that travel outward.

8. A tool that graphs seismic waves as wavy lines is called a(n) ____________seismograph________________.
9. Seismic waves travel at different _______ speeds _______ along Earth’s _______ surface _______ and _______ through _______ Earth’s interior.

What is a volcano?

10. A mountain that forms around an opening in Earth’s crust is a(n) _______ volcano _______.

11. Most volcanoes form near _______ plate _______ edges.

12. A volcano is produced by melted rock, called _______ magma _______ , which erupts onto the surface as _______ lava _______.

13. Some volcanoes form over thin places in Earth’s crust, called _______ hot spots _______.

14. In the Pacific Ocean, an example of volcanoes that formed over a hot spot is the _______ Hawaiian _______ Islands.

Critical Thinking

15. Do you think there are earthquakes in the Hawaiian Islands? Explain.

Possible answer: The Hawaiian Islands' volcanoes form where Earth's plates move over a hot spot. Most volcanoes and earthquakes form where Earth's plates meet. I think that there may be earthquakes in the Hawaiian Islands but that most of them are not strong enough to be noticed.
The Moving Crust

Fill in the blanks.

<table>
<thead>
<tr>
<th>earthquake</th>
<th>fold</th>
<th>plateau</th>
<th>seismograph</th>
</tr>
</thead>
<tbody>
<tr>
<td>fault</td>
<td>mountain</td>
<td>seismic wave</td>
<td>volcano</td>
</tr>
</tbody>
</table>

1. A crack in Earth’s crust along which movement takes place is called a(n) ________ fault ________.

2. A tall landform that rises to a peak is called a(n) ________ mountain ________.

3. A tool that measures the waves from an earthquake is a(n) ________ seismograph ________.

4. A(n) ________ fold ________ is a bend in rock layers.

5. A(n) ________ plateau ________ is a high landform with a flat top.

6. A(n) ________ seismic wave ________ moves outward from the source of an earthquake.

7. An opening in Earth’s crust through which gases and melted rock pass is a(n) ________ volcano ________.

8. When the rock along a fault moves suddenly, a(n) ________ earthquake ________ occurs.
The Moving Crust

Fill in the blanks.

| earthquake | mountains | source |
| faults     | plateaus  | volcanoes |
| folds      | seismic waves |

Many changes in Earth’s crust are caused by the movement of large sections of the crust, called plates. Sometimes when plates meet, rock layers bend and form ________ . Openings in Earth’s crust, called ________, also occur where plates meet. As plates get pushed and pulled cracks form called ________, and the two sides move in opposite directions. When the plates move slowly, ________ and ________ can form.

If the plates move quickly, an ________ can occur. Earthquakes send out ________ that move in all directions from the ________. A seismograph is a tool that scientists use to record and measure the seismic waves of earthquakes.
Meet Ro Kinzler

Read the passage in your textbook about Ro Kinzler. Then list the places that Ro Kinzler and some of the other scientists have traveled.

1. Cascades in Northern California
2. Mid-Atlantic Ridge

Where do Ro and the other scientists perform experiments to test their findings?

Ro and the other scientists go back to the lab at the American Museum of Natural History to perform experiments to test their findings.

What are some of the things they have done with their samples and observations?

1. Ro has heated and squeezed lava samples to find out if they formed deep in the Earth.
2. Ro and the other scientists have used their observations to make maps of the ocean floor.

Write About It

Cause and Effect  Read the article with a partner. Fill out a cause-and-effect chart to record why Ro visits volcanoes and collects lava samples. Tell what happens as a result of her work.
### Cause and Effect

Use the answers to the questions to complete the cause-and-effect chart.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ro travels to the Cascades</td>
<td>She collects active lava samples to study.</td>
</tr>
<tr>
<td>Ro goes to the ocean floor</td>
<td>She creates geological maps of the ocean floor based on careful observations of rock formations.</td>
</tr>
<tr>
<td>Ro would go just about anywhere.</td>
<td>She finds out more about volcanoes.</td>
</tr>
<tr>
<td>Ro does experiments on lava.</td>
<td>She finds out how lava formed.</td>
</tr>
<tr>
<td>Ro goes to the bottom of the ocean</td>
<td>She sees underwater volcanoes.</td>
</tr>
<tr>
<td>Ro observes underwater rock formations</td>
<td>She creates maps of the ocean floor.</td>
</tr>
</tbody>
</table>

#### Guidelines—What to write in the chart:

- Look for why something happened. This is the cause.
- Look for what happened as a result. This is the effect.
Weathering and Erosion

Use your textbook to help you fill in the blanks.

What is weathering?
1. The slow process that breaks rocks into smaller pieces is called ________ weathering. 
2. A rock is broken apart by ________ physical weathering if the rock type does not change. 
3. If a rock contains iron, air and water can react with the iron through ________ chemical weathering and form rust. 

What is erosion?
4. The weathering and removal of rock from one place to another is called ________ erosion. 
5. Erosion can be caused by glaciers, wind, moving water, and ________ gravity. 
6. When the Colorado River eroded the land around the river in Arizona, the ________ Grand Canyon was formed. 

How do glaciers shape the land?
7. Glaciers form in very cold places as thick ________ sheets of ice. 
8. As the weight of the overlying ice increases, the glacier begins to ________ flow. 
9. Deposits left behind by a glacier are called ________ glacial debris and ________ glacial till. 

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LESSON

Outline

10. The mounds that form where till builds up are called ______ moraines. 

How do people shape the land?

11. Most processes change land slowly, but people can make ______ faster changes.

12. People change the land by ______ mining ______ it to get minerals, metals, or fuels.

Critical Thinking

13. Which do you think changes the land more: frozen water or flowing water?

Possible answer: Water causes physical weathering when it flows into cracks in rocks and freezes, breaking up the rock. Flowing water picks up weathered rock and moves it from one place to another. Frozen water, as glaciers, also erodes the land, changing valleys and creating moraines. I think that flowing water changes the land more because glaciers only form in very cold places.
Weathering and Erosion

Secret Word

Read each clue. Write the answer in the correct squares in the puzzle. Then, figure out what the secret word is, and fill in the rest of the letters.

Across
1. rocks or gravel left by a glacier
2. a slow process that breaks rocks into smaller pieces
3. the carrying away of weathered pieces of rock
4. weathering that breaks down rock without changing the rock type
5. an unsorted mixture of debris dropped by a glacier
6. the bottom end of a glacier
7. features that form where glacial till builds up

Write the secret word that is running down the puzzle.

deposition
Weathering and Erosion

Fill in the blanks.

- chemical weathering
- moraines
- wind
- glaciers
- physical weathering
- gravity
- water

Rocks are constantly broken down by two processes, called weathering and erosion. Rocks can be broken down into smaller pieces without changing the type of rock through **physical weathering**. Minerals in rocks can be changed to other minerals through **chemical weathering**.

Erosion moves weathered rock from one place to another through **gravity**, **wind**, **water**, and **glaciers**. Huge masses of ice and snow, called **glaciers**, also erode land. Moving glaciers pick up rocks, gravel, and sand and deposit them as glacial till and in mounds called **moraines**.

Gravity causes erosion by moving weathered rock downhill.
Land Over Time

Write About It
Expository Writing  Write a paragraph that summarizes “Land Over Time.” Include the main idea and the most important details.

Getting Ideas
Think about what you read in “Land Over Time.” Then fill in the summary chart.

The roots from seeds that grow on the rock causes it to crack. Rain falls in these cracks. When the rain freezes, the rock cracks even more and pieces fall off.

<table>
<thead>
<tr>
<th>Seeds fall in patches of soil in rocks and their roots cause cracks.</th>
<th>Rain causes even more cracks.</th>
<th>Water freezes and cracks the rocks even more until pieces break off.</th>
</tr>
</thead>
</table>

Planning and Organizing
Brandon wrote three sentences. Write “MI” next to the sentence that tells the main idea. Write “D” next to each sentence that tells a detail.

1. **D** Water freezes when the temperature drops below 32°F.
2. **D** When water freezes, it expands, and the cracks in rocks get bigger.
3. **MI** Weather changes land over a long period of time.
Revising and Proofreading
Here are some sentences that Brandon wrote. He wants to join them together. Read the sentences. Then look at the pair of words. Circle the word that best fits to join the sentences. Then write the new sentence on the line. Put a comma before the word.

1. Rocks have small cracks. The rain fills the cracks. and but

   Rocks have small cracks, and the rain fills the cracks.

2. Roots get thicker. The cracks widen over time. but so

   Roots get thicker, so the cracks widen over time.

3. Mountains are very sturdy landforms. They are being worn down. so but

   Mountains are very sturdy landforms, but they are being worn down.

Drafting
Begin your summary. Start with a topic sentence that tells the main idea.

Sample sentence: Weathering changes the land over time.

Now write your summary. Use a separate piece of paper. Start with the topic sentence you wrote above. Include only important facts and details from “Land Over Time.” Put them in your own words.

Now revise and proofread your writing. Ask yourself:

- Did I tell only the most important information?
- Did I draw a conclusion based on the information presented?
- Did I correct all mistakes?
Changes Caused by the Weather

Use your textbook to help you fill in the blanks.

How do floods and fires change the land?

1. An overflow of water onto land that is normally dry is called a(n) _______ flood ________.

2. Flood waters usually come from heavy _______ rain ________ or quickly melting snow.

3. A flood can help the land by depositing rich _______ soil ________ on it.

4. A fire can be caused by _______ lightning ________ or other natural sources.

5. Plants and animals may lose their _______ habitats ________ after a fire.

How do storms change the land?

6. The storm caused by a column of air that spins rapidly is called a(n) _______ tornado ________.

7. Usually, tornadoes spin off of severe _______ thunderstorms ________.

8. Tornadoes are common in the _______ Great Plains ________ region of the United States.

9. A swirling system of winds, huge walls of clouds, and pounding rains is called a(n) _______ hurricane ________.

10. Hurricanes form over warm _______ oceans ________.
11. Hurricanes can last for many days and stretch for hundreds of kilometers.

12. Hurricanes are becoming more and more common in some places, possibly because of higher temperatures.

**How do landslides change the land?**

13. Rocks and water-soaked soil move quickly down a hillside during a(n) landslide.

14. Tons of snow and ice move suddenly down a mountain during a(n) avalanche.

15. A cause of landslides is gravity, which pulls rocks from high places to low places.

**Critical Thinking**

16. Which do you think causes more damage to Earth: too much water or not enough water?

   Possible answer: I think that too much water causes more damage to the Earth, because so many different events can take place as a result. Floods occur when water from heavy rains and melting snow cover land that is usually dry. Hurricanes bring heavy rains, and tornadoes often come with thunderstorms. Landslides occur when water-soaked land slides down a slope. Avalanches are the movement of frozen water in the form of snow and ice. Fires spread when plants are dry because of the lack of rain.
Changes Caused by the Weather

Match the correct letter with the description.

- a. avalanche
- b. fire
- c. flood
- d. hurricane
- e. landslide
- f. gravity
- g. tornado
- h. lightning

1. ______ a column of air that spins rapidly
2. ______ a swirling system of winds, huge clouds, and pounding rains
3. ______ can be fueled by dry plants and spread by wind
4. ______ an overflow of water onto land that is normally dry
5. ______ the force that pulls rocks and other objects from a high place to a low place
6. ______ sliding ground caused when a hillside is soaked with rainwater
7. ______ the sudden movement of tons of snow and ice down a hill or mountain
8. ______ can cause natural forest fires
Violent weather, or storms, can cause quick changes in the land. A column of air that spins rapidly is called a(n) _________. Tornadoes usually form with severe _________. A larger and longer-lasting storm with heavy rain and swirling winds is called a(n) _________.

When heavy rain soaks the ground on a hillside, a(n) ________ can occur. Heavy rains or melting snow can also cover land that is usually dry, causing a(n) _________. Floods destroy property, but they also leave rich ________ on the land. When there is not enough rain, plants become dry, and ________ can damage the land. Fires can be started by natural events, such as lightning, and the actions of careless people.
Shaping Earth

Circle the letter of the best choice.

1. Mountains, plains, and plateaus are examples of
   a. avalanches.
   b. landforms.
   c. landslides.
   d. ridges.

2. Which underwater feature is similar to a canyon?
   a. the continental shelf
   b. the continental slope
   c. an ocean ridge
   d. a trench

3. What is the outermost layer of Earth?
   a. the crust
   b. the inner core
   c. the mantle
   d. the outer core

4. Which of the following is NOT a way in which mountains form?
   a. folding rock
   b. landslides moving large amounts of land
   c. rocks moving along a fault
   d. volcanoes erupting

5. What moves in all directions from the source of an earthquake?
   a. faults
   b. folds
   c. seismic waves
   d. seismographs

6. Which statement is true about volcanoes?
   a. Lava and ash come out of an erupting volcano.
   b. Volcanoes erupt only on land.
   c. Volcanoes form over cold spots.
   d. Volcanoes only form at the point where two plates meet.

7. A large, slow-moving section of Earth’s crust and upper mantle is called a
   a. continent.
   b. fault.
   c. fold.
   d. plate.
8. Acid rain changes the minerals in rocks to other minerals. What is this process called?
   a. chemical weathering
   b. deposition
   c. erosion
   d. physical weathering

9. Which of the following was formed by erosion?
   a. the Grand Canyon
   b. the Great Plains
   c. the Hawaiian Islands
   d. the Mississippi River

10. What is a large, slow-moving buildup of snow and ice?
    a. an avalanche
    b. a flood
    c. a glacier
    d. a landslide

11. The unsorted mixture of rocks dropped by a glacier along its end or sides is called
    a. debris.
    b. glacial till.
    c. a moraine.
    d. a terminus.

12. What happens when water covers land that is usually dry?
    a. a fire
    b. a flood
    c. a hurricane
    d. a tornado

13. What kind of storm forms over an ocean?
    a. a flood
    b. a hurricane
    c. a dust storm
    d. a tornado
Saving Earth’s Resources

Use your textbook to help you fill in the blanks.

Earth’s Resources

Rocks
- are made of minerals
- and are classified by how they are formed

Soil
- is needed for growing crops
- and is made of weathered rock, humus, water, and air

Water
- is needed by all living things
- and freshwater is found mostly in glaciers and ice caps

Minerals
- are found in Earth’s crust
- and is used to make steel, aluminum, products, silicon chips, and jewelry
Minerals and Rocks

Use your textbook to help you fill in the blanks.

What is a mineral?
1. Nonliving, natural substances that make up rock are called _________ minerals.
2. Minerals can be identified by their _________ properties: color, _________ hardness, luster, and streak.
3. Minerals are the building blocks of _________ rocks.

What are igneous and sedimentary rocks?
4. Minerals offer clues about how a rock _________ forms.
5. A rock that froms from melted rock is _________ igneous rock.
6. Melted rock, called _________ magma, cools and hardens to form igneous rock.
7. Igneous rocks are classified by how quickly they _________ cool and the size of the mineral grains that form.
8. Layers of substances are pressed and cemented together to form _________ sedimentary rock.
9. Scientists compare the position of layered rocks to find a rock’s _________ relative age.
10. A rock layer and any _________ fossils in that rock have the same relative age.
What are metamorphic rocks?

11. Heat and pressure form _______ metamorphic _______ rocks.

12. Metamorphic rocks can form from _______ igneous _______ and _______ sedimentary _______ rocks, or from other metamorphic rocks.

13. Metamorphic rocks are different than their original form because their _______ properties _______ change.

14. Rocks change from one form to another in the _______ rock cycle _______.

How do we use rocks?

15. People use rocks and minerals as _______ resources _______.

16. Rocks and minerals are used for _______ building _______ schools and other structures, and to make steel, aluminum products, silicon chips, and _______ jewelry _______.

Critical Thinking

17. Which type of rock (metamorphic, sedimentary, or igneous) do you think is most useful?

Possible answer: I think that sedimentary rock is most useful. It can be used to make glass, bricks, china, and pottery. It is also used to make buildings and create plates and bowls. Since we use chalk in school, live and work in buildings, and eat off of china and pottery, we use sedimentary rock all the time.
Minerals and Rocks

Match the correct letter with the description.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>d.</td>
<td>g.</td>
<td>h.</td>
</tr>
<tr>
<td>b.</td>
<td>e.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>f.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. _____ **c** a natural, nonliving substance that occurs in rocks
2. _____ **a** results from melted rock that cools and hardens
3. _____ **h** results from sediment that is pressed and cemented together
4. _____ **e** the age of a rock that is found by comparing the position of the rock to other rock layers
5. _____ **b** formed by heat and pressure
6. _____ **g** the name of the process by which rocks change from one form to another
7. _____ **f** any material found on Earth that can be used by people
8. _____ **d** characteristics like color, hardness, luster, and streak
Minerals and Rocks

Fill in the blanks.

<table>
<thead>
<tr>
<th>fossils</th>
<th>nonliving properties</th>
<th>rock cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>igneous rock</td>
<td></td>
<td>sedimentary rock</td>
</tr>
<tr>
<td>metamorphic rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>relative ages</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minerals come from Earth’s crust. They are found as nonliving solids. Many minerals and rocks have properties that make them useful to people.

Scientists classify rocks in three main groups. Melted rock that cools and hardens forms igneous rock. Sediments that have been pressed and cemented together over thousands of years form sedimentary rock, which can also contain fossils. Scientists can find the relative ages of rocks and fossils by looking at their position in layers of rock. Rocks formed by heat and pressure are called metamorphic rock. All types of rocks move through the rock cycle. This is a neverending process by which Earth’s rocks change from one form to another.
Soil

Use your textbook to help you fill in the blanks.

What is soil made of?

1. If you look at soil with a hand lens, you will find small pieces of rocks, minerals, and ____________ humus.

2. You might not see them, but soil is made up of ____________ water, air, and ____________ living things as well.

3. When plants and animals die, ____________ bacteria and fungi decompose them.

4. All the layers of soil, from Earth’s surface down to the bedrock, are shown in a(n) ____________ soil profile.

5. The different layers of a soil profile are called ____________ horizons and include topsoil, ____________ subsoil, and weathered ____________ bedrock.

What are some properties of soil?

6. The property of soil that refers to the size of soil particles is called ____________ texture. Clay is fine with small particles and sandy soil is ____________ coarse with large particles.

7. Other properties of soil are color and ____________ permeability, which indicates how easily ____________ water passes through soil.
8. The spaces between the particles in soil, called pore spaces, determine how ______ porous the soil is.

Why is soil type important?

9. Soil that is permeable to air and ______ water will allow living things to survive.

10. If the soil does not hold enough water, crop plants can ______ dry up. If the soil holds too much water, crop plants can ______ drown.

Critical Thinking

11. What do you think pedologists, scientists who study soil, can learn by picking up a handful of soil?

Possible answer: I think pedologists can probably look at a handful of soil to see what’s in it. If it is rich in humus, then it is topsoil and plant roots can grow here. If the soil contains clay, it is subsoil. Some sturdy plant roots may grow here. Pedologists can also see the color and texture and how porous and permeable the soil is. If it is porous and permeable, it can hold more air and water and grow more plants.
Soil

What am I?

Choose a word from the word box below that answers each question.

| a. horizon | c. permeability | e. porous | g. subsoil |
| b. humus   | d. pore spaces  | f. soil profile | h. topsoil |

1. ______ b I am the decayed plant and animal matter in soil. What am I?
2. ______ f I am a section of soil that includes all layers from the topsoil to the bedrock. What am I?
3. ______ a I am the name for a layer of soil. What am I?
4. ______ h I am the name for the surface layer of soil. What am I?
5. ______ g I am the layer of soil under the top layer of soil. What am I?
6. ______ d I am the spaces between the particles that make up soil. What am I?
7. ______ c I am a characteristic of soil that depends on the size and number of its pore spaces. What am I?
8. ______ e I am any material that lets water pass through it. What am I?
Soil

Fill in the blanks.

horizons  pore spaces  resource
humus  porous  soil profile
minerals  properties  weathered rock

Farmers use soil to grow plants that are used for food and other products. Soil is an important natural resource. It is a mixture of small pieces of rock and decayed plant and animal matter, called humus. Soil contains pore spaces that can be filled with air or water, meaning that it is porous.

Soil forms in layers called horizons. Each layer of soil has its own properties that make up a(n) soil profile. The top layer, or topsoil, is rich with humus and minerals. The next layer is called subsoil. The bottom layer is made of broken bits of bedrock or weathered rock. Soil is different from place to place because the minerals and rocks are different.
Resources from the Past

Use your textbook to help you fill in the blanks.

What are fossils?

1. Evidence of a living thing from long ago is preserved as a(n) \underline{fossil}.

2. Many fossils are found preserved in \underline{sedimentary} rock.

3. Fossils also form in spaces left in rock by dead organisms. These spaces are called \underline{molds}. Minerals fill the spaces, forming fossils called \underline{casts}.

4. Some fossils are formed when an organism such as a leaf is pressed into a soft surface, leaving a(n) \underline{imprint}.

5. An entire organism can be preserved, such as an insect trapped in \underline{amber} or a mammoth trapped in \underline{ice}.

How do we study fossils?

6. Fossils tell how Earth’s land, \underline{climate}, and living things have changed over time.

7. Fossils and layers of rock are evidence of changes that took place over long spans of \underline{geologic} time.
What are fossil fuels?

8. Something that can supply ________ energy ________ is a fuel.

9. Fuel that is made from the remains of ancient living things is a(n) ________ fossil fuel ________.

10. Fossil fuels form from the remains of buried ________ plants ________ and ________ animals ________.

11. Fossil fuels are ________ nonrenewable ________ resources because they cannot be replaced easily.

What can we use instead of fossil fuels?

12. Air, water, plants, and animals are ________ renewable ________ resources because they can be replaced in ________ nature ________.

13. Renewable energy sources include solar energy, ________ windmills ________ that harness the wind, and energy from ________ heat ________ inside Earth.

Critical Thinking

14. Do you think you could go to school without using fossil fuels?

Possible answer: Yes, I think I could because the Sun could be used for light, and the Sun, windmills, and the ocean could be used for energy. Also, I could walk to school.
Resources from the Past

Choose a word from the word box below that correctly fills in the blank.

<table>
<thead>
<tr>
<th>amber</th>
<th>fossil</th>
<th>imprint</th>
<th>nonrenewable</th>
</tr>
</thead>
<tbody>
<tr>
<td>cast</td>
<td>fossil fuel</td>
<td>mold</td>
<td>renewable</td>
</tr>
</tbody>
</table>

1. An energy source that cannot be replaced easily is a(n) _______nonrenewable______ resource.
2. Fuel made from the remains of ancient living things is called _______fossil fuel______.
3. Minerals that fill the space left in a rock by a decayed organism form a fossil called a(n) _______cast______.
4. An energy source that nature replaces quickly is a(n) _______renewable______ resource.
5. The space in a rock left by the remains of an organism is a(n) _______mold______.
6. Sap from a tree that hardens into a hard, yellow material forms _______amber______.
7. The preserved evidence of a living thing from long ago is a(n) _______fossil______.
8. The fossil formed by an organism that has been pressed into a soft surface is a(n) _______imprint______.
Resources from the Past

Fill in the blanks.

<table>
<thead>
<tr>
<th>casts</th>
<th>fossil fuels</th>
<th>imprints</th>
<th>nonrenewable</th>
</tr>
</thead>
<tbody>
<tr>
<td>energy</td>
<td>fossils</td>
<td>molds</td>
<td>renewable</td>
</tr>
</tbody>
</table>

Earth’s land, water, climate, and living things on Earth have undergone many changes over time. Scientists study remains from long ago, called ____________, to learn about life long ago. They study ____________, that form in spaces, ____________, that fill those spaces, ____________, preserved in soft surfaces, and fossils found in amber and ice. The remains of living things buried for millions of years are also a(n) ____________ energy source. Coal, oil, and natural gas are ____________ fossil fuels that are burned to release their stored energy.

Fossil fuels are ____________ energy sources that take millions of years to form and cannot be replaced easily. Solar energy and energy from moving water and wind are ____________ sources of energy. Scientists are working to find ways to use renewable energy sources before we use up all of our fossil fuels.
Water

Use your textbook to help you fill in the blanks.

Where is Earth’s water found?

1. Most of Earth’s fresh water is found in solid form as 
   ____glaciers_____ and ____ice caps_____.
2. Streams, rivers, and lakes hold the rest of Earth’s fresh 
   water in ____liquid____ form.
3. Rain soaks into the soil and collects there 
   as ____soil water_____.
4. The place where water drains downhill into one river is 
   called a(n) ____watershed_____.

How is fresh water supplied?

5. Water from lakes and rivers is sometimes stored in a(n) 
   ____reservoir____ so that people will have a year-
   round water supply.
6. Rain or melted snow that flows over land is called 
   ____runoff_____. It may carry ____bacteria____ 
   or harmful ____chemicals_____.
7. Digging a well is a common way to get ____groundwater_____.

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8. Most wells have a(n) pump to bring groundwater to the surface.

9. Impurities are removed from water at a(n) water treatment plant to make it safe to use.

How do we use water?

10. People use fresh water for farming.

11. We use water to generate electricity.

12. Farmers use irrigation to bring water through pipes and ditches to their crops.

13. People also use water for fun activities, including swimming, boating, and fishing.

Critical Thinking

14. How do you think the water in a watershed is used?

Possible answer: Watersheds can contain fresh water, salt water, or a mixture of both. I think if the water in a watershed is very fresh and contains only a little salt, then it can be used by the plants and animals that live there. The water in the watershed may drain directly to the ocean, or it may be sent to a water treatment plant.
Vocabulary

Water

Match the correct word with the description.

| a. groundwater | c. reservoir | e. seawater | g. watershed |
| b. irrigation  | d. runoff     | f. soil water| h. well      |

1. _____ rain or melted snow that flows over land and collects in streams or brooks

2. _____ a region where water from different sources drains into one river

3. _____ rain that soaks into the ground and is used by plants

4. _____ water that is stored in spaces in underground rocks

5. _____ a deep hole dug in the ground to reach groundwater

6. _____ an artificial lake built by people to hold fresh water

7. _____ a method used by farmers to bring water to their crops through pipes or ditches

8. _____ another name for ocean water that contains too much salt for people or plants
Oceans cover about three-fourths of Earth’s surface. Ocean water is not useful to most living things, including people, because it is salt water. Most living things need fresh water to survive. Fresh water is found as a(n) solid in ice caps and glaciers. It is found as a(n) liquid in streams, rivers, and lakes.

Fresh water can be pumped to the surface through wells or used by farmers for irrigation. Fresh water from lakes and rivers is stored in reservoirs for year-round use in nearby communities. Harmful materials are removed at water treatment plants before the water is sent to homes, schools, and hospitals.
Saving Water

Write About It

**Persuasive Writing** Write a letter to the editor of your local newspaper. Your letter should inform people about the need to keep the groundwater clean. Include facts and details to make your letter persuasive.

Getting Ideas
Research how groundwater becomes polluted. Then use the chart below to help you organize your ideas for keeping groundwater clean. Write your opinion in the top box. Write three reasons in the bottom boxes.

<table>
<thead>
<tr>
<th>We must keep our groundwater clean.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water animals need clean places to live.</td>
</tr>
<tr>
<td>People need clean drinking water.</td>
</tr>
<tr>
<td>Plants die off if the water is polluted.</td>
</tr>
</tbody>
</table>

Planning and Organizing
Isabella wrote three sentences. Write “O” next to the sentence that tells her opinion. Write “R” next to each sentence that tells a convincing reason to keep groundwater clean.

1. **R** Water animals need clean places to live and clean water to drink.
2. **O** I strongly believe that we must do more to keep our water clean.
3. **R** People need clean drinking water to live.
Revising and Proofreading

Here are some sentences that Isabella wrote. There are some errors in punctuation. Proofread the sentences. Find the five errors. Insert the correct punctuation mark, or delete the punctuation mark if it is incorrect.

Dear Editor:

Every day I walk by the pond and there are very few water lilies blooming. Dr. McGregor says that the groundwater is polluting the pond. It is because of the factory. There are leaks in the tanks and I believe this is a serious problem. Chemicals leak into Earth. This causes the pollution. What is the paper’s position on this serious problem? Isn’t it time you spoke up?

Drafting

Begin your letter. Start by stating the reason for your letter.

Sample answer: Our community must work together to keep our groundwater clean.

Now write your letter. Use a separate piece of paper. Start with the sentence you wrote above. Write about the importance of keeping our groundwater clean. Include convincing reasons. Make sure you tell the reader what actions could be taken to solve this problem.

Now revise and proofread your writing. Ask yourself:

- Did I clearly state my opinion about this topic?
- Did I use convincing reasons and arguments?
- Did I correct all mistakes?
Pollution and Conservation

Use your textbook to help you fill in the blanks.

What is pollution?

1. All of the living and nonliving things in an area make up the ________ environment.

2. Dangerous or harmful materials cause ________ pollution when they are added to the environment.

3. Pollution can be caused by ________ natural events or human ________ activities.

4. Waste gases in the air cause ________ air pollution. They create ________ smog or combine with water droplets to create ________ acid rain.

5. Oil spills, fertilizers, and pesticides in oceans and streams can cause ________ water pollution.

6. If trash in landfills is not stored in the right way, it can cause ________ land pollution.

How can we protect the soil and water?

7. One way to protect the environment is to use ________ resources wisely by practicing ________ conservation.
8. Soil conservation includes activities that keep soil healthy for growing _______.

9. Towns and cities conserve their water supply by cleaning wastewater at _______ treatment plants.

10. People practice _______ conservation whenever they use water wisely.

**What are the 3 Rs?**

11. The 3 Rs are main ways to _______ resources.

12. People can conserve resources and _______ waste by using less of something.

13. People can _______ things instead of throwing them away after one use.

14. People conserve when they _______ by making something new from used materials.

**Critical Thinking**

15. Do you think that reducing pollution and practicing conservation work better in big cities or small cities?

Possible answer: I think reducing pollution and practicing conservation work well in both kinds of cities. Big cities cause more pollution and use more resources. That affects people who live in those cities and people who live around those cities. When people in big cities reduce pollution and practice conservation, they affect their cities and the cities around them. When small cities reduce pollution and practice conservation, they make their cities better for themselves.
Pollution and Conservation

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

1. All of the living and nonliving things in a certain area make up its _______ environment.

2. Harmful materials found in the environment cause _______ pollution.

3. Waste gases combined with water droplets form _______ acid rain.

4. Using resources wisely is _______ conservation.

5. A fertilizer made from decaying table scraps and dead plants is _______ compost.

6. The 3 Rs of conservation are _______ reduce, _______ reuse, and _______ recycle.
Pollution and Conservation

Fill in the blanks.

<table>
<thead>
<tr>
<th>acid rain</th>
<th>fertilizers</th>
<th>smog</th>
</tr>
</thead>
<tbody>
<tr>
<td>ashes</td>
<td>pollution</td>
<td>smoke</td>
</tr>
<tr>
<td>conservation</td>
<td>resources</td>
<td>water</td>
</tr>
</tbody>
</table>

Living things get what they need from their environment.
Living things need clean air, clean __________ water, and healthy land to survive. Harmful materials enter the environment and cause __________ pollution. Natural events, such as forest fires and erupting volcanoes, can pollute the environment with __________ smoke and __________ ashes. Waste gases from burning fossil fuels can produce __________ smog. These gases may also combine with water droplets in the air and produce __________ acid rain.

Pesticides and __________ fertilizers pollute both the water and the land. People can help control pollution by using __________ resources wisely and practicing __________ conservation. People must practice the 3 Rs of conservation: reduce, reuse, and recycle.
Saving the Soil

Read the passage in your textbook. As you read, write down the topic of each paragraph. Also, pay attention to the supporting details about saving the soil.

Topic sentences:
1. Sometimes, the way we grow our food can harm the soil.
2. Some farmers use contour plowing.
3. Some farmers use no-till planting.
4. Some farmers grow cover crops.

Write About It
Main Idea and Details
1. Why do farmers need to protect the soil?
2. What are some ways that farmers protect the soil? List the advantages and disadvantages of these methods.

1. The soil must be protected so that we can continue to grow healthy crops.

2. Farmers can protect soil by using contour plowing, by not plowing their fields after a harvest, and by planting cover crops. Contour plowing takes more time and uses more fuel than plowing in straight rows. Farmers who use no-till planting have to use chemical weed killers, and these may be poisonous.
Use the Main Idea and Details graphic organizer to record information about what farmers do to save the soil.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contour plowing is helpful.</td>
<td>It is used on a hillside to stop rainwater flowing downhill and carrying away soil and nutrients.</td>
</tr>
<tr>
<td>Contour plowing is not easy.</td>
<td>It takes more time and uses more fuel than straight plowing.</td>
</tr>
<tr>
<td>Some farmers do not plow their fields after a harvest.</td>
<td>Instead, they place seed in holes in the ground.</td>
</tr>
<tr>
<td>After the harvest, some farmers plant cover crops, like clover.</td>
<td>This adds nutrients and protects the ground.</td>
</tr>
<tr>
<td>Some farmers use no-till planting instead of plowing.</td>
<td>They dig holes and drop in seeds. Farmers may have to use chemicals to kill weeds that plowing would have removed.</td>
</tr>
</tbody>
</table>
Saving Earth’s Resources

Circle the letter of the best answer.

1. What is a mineral?
   a. a nonliving substance formed in nature
   b. a nonliving substance made only in factories
   c. a living substance formed in nature
   d. a living substance found only in fossils

2. The type of rock formed when melted rock cools and hardens is
   a. magma.
   b. sedimentary.
   c. igneous.
   d. metamorphic.

3. The neverending process by which rocks change from one form to another is
   a. a type of life cycle.
   b. the rock cycle.
   c. the cooling of magma.
   d. the relative age of a rock.

4. What does a soil profile show?
   a. the color of the soil under the surface
   b. the layers of soil called horizons
   c. the texture of the soil under the surface
   d. the pore spaces in the soil under the surface

5. The rate at which water flows through soil is known as the soil’s
   a. pore space.
   b. texture.
   c. permeability.
   d. profile.

6. What is the name for the preserved evidence of once-living things?
   a. molds
   b. fossils
   c. casts
   d. imprints
Circle the letter of the best answer.

7. What types of resources are fossil fuels such as coal, oil, and natural gas?
   a. nonrenewable
   b. renewable
   c. preserved
   d. unlimited

8. A lake built by people to hold water is a
   a. treatment plant.
   b. reservoir.
   c. watershed.
   d. well.

9. Bringing water to a farmer’s fields through pipes and ditches
   a. is called a reservoir.
   b. provides transportation.
   c. is called irrigation.
   d. produces electricity.

10. All of the living and nonliving things in an area make up
    a. the environment.
    b. a landfill.
    c. harmful pollution.
    d. a community.

11. What is pollution?
    a. a natural resource in the environment
    b. harmful material in the environment
    c. anything that happens in the environment
    d. a manmade resource in the environment

12. Protecting resources and using them wisely is known as
    a. conservation.
    b. pollution.
    c. crop rotation.
    d. irrigation.

13. Making a new and different product from old materials is called
    a. reusing.
    b. recycling.
    c. reducing.
    d. remaking.
Tornado Tears Through Midwest
From *Time for Kids*

Read the Unit Literature feature in your textbook.

**Write About It**

**Response to Literature** What would happen if a tornado struck your community? Write a fictional story. Describe how your community would stay safe. How would it rebuild after the disaster?

Possible answer: I live in Blue Ash, Ohio, just outside of Cincinnati. The last big tornado struck in April of 1999, but I was just a baby. If a tornado struck my community, everyone would be prepared. We all have Home Tornado Plans with disaster supplies, like extra sleeping bags, blankets, flashlights, water, food, clothes, a first-aid kit, and a battery-operated radio. These supplies are kept in the basement, which is the best place to go during a tornado. Tornadoes don’t last long, but they can do a lot of damage. After the tornado, we would see what had to be rebuilt. The roads would be cleared of any trees or debris. The electricity, water, and phones would be restored first. If the school buildings were destroyed, students would attend classes in community centers and churches. The mayor and our town council would meet to decide how to rebuild our town.
Weather and Climate

Fill in the blanks in the graphic organizer below with facts you have learned from the chapter on weather and climate.

<table>
<thead>
<tr>
<th>Weather Event</th>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Thunderstorm</td>
<td>A cold air mass moves in quickly and pushes under a(n) warm air mass</td>
<td>Heavy precipitation falls to the ground.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lightning can be seen and thunder can be heard.</td>
</tr>
<tr>
<td>Light Rain</td>
<td>A warm air mass pushes into a cold air mass.</td>
<td>Light precipitation falls, but there is no lightning or thunder.</td>
</tr>
<tr>
<td>Hurricane</td>
<td>A wide storm forms over warm ocean water.</td>
<td>A very large storm forms with very fast winds and heavy precipitation.</td>
</tr>
<tr>
<td>Rainy Weather (that lasts for days)</td>
<td>Two air masses are not moving into one another, creating a(n) stationary front</td>
<td>Precipitation falls for several days.</td>
</tr>
</tbody>
</table>
Air and Weather

Use your textbook to help you fill in the blanks.

What is in the air?

1. The blanket of air surrounding Earth is called the _______ atmosphere _______.

2. The atmosphere is made up mostly of _______ nitrogen _______ and _______ oxygen _______.

3. The four layers of Earth’s atmosphere, from lowest to highest, are _______ troposphere _______, _______ stratosphere _______, mesosphere, and thermosphere.

What is weather?

4. The condition of the atmosphere at a given time and place is called _______ weather _______.

5. When you measure how hot or cold something is, you measure its _______ temperature _______. Three factors that affect air temperature include time of day or night, _______ the season _______, and closeness to oceans.

6. Warm air particles are _______ less _______ dense, or packed together, than cold air.

7. A measure of the amount of moisture in the air is _______ humidity _______.

8. As air cools, the air pressure _______ increases _______.

---

Chapter 7 • Weather and Climate
Reading and Writing

Use with Lesson 1
Air and Weather
9. Moving air is called ___________wind_________.

10. Air moves when the Sun’s ___________energy_________ heats the air.

11. Any form of water that falls from the clouds is ___________precipitation_________. The term includes rain, snow, sleet, and ___________hail_________.

**How can you measure weather?**

12. Scientists collect data from a ___________weather station_________.

13. To measure rainfall, scientists collect rain in a tube called a(n) ___________rain gauge_________.

14. A tool used to measure air pressure is called a(n) ___________barometer_________.

**Critical Thinking**

15. What weather tools do you think are used in the desert, the humid tropical rain forest, and the frozen tundra?

   Possible answer: I think the thermometer and the rain gauge are used in the desert. I think the thermometer, rain gauge, and hygrometer are used in the tropical rain forest. I think the thermometer and anemometer are used in the frozen tundra.
Air and Weather

What am I?

Choose a word from the word box below that answers each question.

<table>
<thead>
<tr>
<th>a. air pressure</th>
<th>d. rain gauge</th>
<th>g. wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. barometer</td>
<td>e. temperature</td>
<td>h. wind vane</td>
</tr>
<tr>
<td>c. humidity</td>
<td>f. thermometer</td>
<td></td>
</tr>
</tbody>
</table>

1. _______ I am the weight of the air above you. What am I?
2. _______ I am moving air. What am I?
3. _______ I can tell you how hot or cold the air is. What am I?
4. _______ I can tell you how much it rained. What am I?
5. _______ I can tell you what the air pressure is. What am I?
6. _______ I point in the direction of the wind. What am I?
7. _______ I am the amount of moisture in the air. What am I?
8. _______ I am a measure of how hot or cold something is. What am I?
Air and Weather

Fill in the blanks.

<table>
<thead>
<tr>
<th>air pressure</th>
<th>lowest</th>
<th>thermometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>barometer</td>
<td>particles</td>
<td>troposphere</td>
</tr>
</tbody>
</table>

Weather is the condition of Earth’s atmosphere at any given time and place. All weather takes place in the lowest level of the atmosphere, called the troposphere. A measure of how hot or cold the air is, or temperature, is found with a(n) thermometer. Cool air particles are packed more closely than warm air particles.

A measure of the weight of the air pushing down on an area is called air pressure. It is measured with a(n) barometer. Cool air has a(n) higher air pressure than warm air. A difference in air pressures causes the movement of air, or wind.
Watching Spring Weather

Write About It

Expository Writing Observe the weather in your area every day for two weeks. Record the temperature, air pressure, precipitation, clouds, and wind speed. Write a newspaper article about the changes you observed.

Getting Ideas

Use the information you recorded to fill out the chart below. Under main idea, write an important idea about the weather. Then write facts and details that support your main idea.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The weather has changed a lot during the last two weeks.</td>
<td>It started out sunny with a temperature in the 70s.</td>
</tr>
<tr>
<td></td>
<td>The temperature then dropped to the 50s.</td>
</tr>
<tr>
<td></td>
<td>Heavy rain and thunderstorms came.</td>
</tr>
</tbody>
</table>

Planning and Organizing

Here are some sentences Zack wrote about the weather in his area. Write “MI” if the sentence tells the main idea. Write “D” if it tells a detail.

1. D At first, the temperature was in the 70s.
2. MI The weather has changed a lot during the last two weeks.
3. D There wasn’t a cloud in the sky.
Revising and Proofreading

Here are some sentences Zack wrote. Combine each pair of sentences. Use the transition word in parentheses.

1. There has been a big threat of forest fires. It hasn’t rained in two weeks. (because)
   There has been a big threat of forest fires because it hasn’t rained in two weeks.

2. Brush fires start. Leaves and grass dry out from the wind. (when)
   Brush fires start when leaves and grass dry out from the wind.

3. The weather report said to expect thunderstorms. There is a warm air mass moving through our region. (because)
   The weather report said to expect thunderstorms because there is a warm air mass moving through our region.

Drafting

Write a sentence to begin your article about weather in your area. Tell your main idea about how it changed.

Sample sentence: The weather has changed a lot during the last two weeks.

Now write your article. Use a separate piece of paper. Remember to include specific details such as the amount of rainfall.

Now revise and proofread your writing. Ask yourself:

► Did I tell a main idea about the weather?
► Did I include facts and details to back up this idea?
► Did I correct all mistakes?
The Water Cycle

Use your textbook to help you fill in the blanks.

Why does water change state?

1. Water moves from Earth’s surface into the _______atmosphere_____.
2. Water changes _______state______ as it moves.
3. Water in the gas state is called _______water vapor_____.
4. The process during which a liquid slowly changes to a gas is called _______evaporation_____. Heat from the _______Sun______ causes ocean water to evaporate.
5. The process during which a gas changes to a liquid is called _______condensation_____. When the air cools, water vapor condenses on objects; for example, _______dew______ forms on grass.

Where does water go?

6. Earth’s water is constantly changing state by moving through the _______water cycle_____.
7. When water vapor rises, it cools and _______condenses_____; this forms clouds.
8. When water evaporates from the leaves of plants, it is called _______transpiration_____.
9. Rain, snow, sleet, and hail are different forms of _______precipitation_____.

© Macmillan/McGraw-Hill
What are some types of clouds?
10. Low, layered clouds are called _______ stratus _______ clouds.

11. White, puffy _______ cumulus _______ clouds can become thick and dark _______ cumulonimbus _______ clouds that produce precipitation.

12. Thin, wispy clouds high in the sky are called _______ cirrus _______ clouds.

What are other forms of precipitation?
13. When bits of ice crystals form in clouds, they may fall to the ground as _______ snow _______.

14. Hailstones form inside the tall clouds of a _______ thunderstorm _______ and are usually the size of peas.

Critical Thinking
15. Describe how water changes form inside your house, like it does in the water cycle.

Possible answer: In the water cycle, water changes from liquid to gas to liquid again. I think there are examples in my house in the bathroom and the kitchen. When I take a hot shower or bath, water vapor forms as steam and then drips on the mirror. When water is boiled, water vapor rises and then settles as liquid on the pot cover.
The Water Cycle

Match the correct word with its description.

| a. condensation | d. melting | g. snow |
| b. evaporation   | e. precipitation | h. water cycle |
| c. freezing      | f. sleet       | i. water vapor |

1. _____c_____ This is the condition that causes a liquid to change into a solid.
2. _____h_____ This is the ongoing movement of water through many different processes and states.
3. _____f_____ These are small drops of rain that freeze in the air before they hit the ground.
4. _____b_____ This is a process where a liquid becomes a gas.
5. _____g_____ These are ice crystals that form in clouds and fall to the ground.
6. _____e_____ This is water that falls from clouds to Earth.
7. _____i_____ This is the gas form of water.
8. _____a_____ This is the process of a gas becoming a liquid.
9. _____d_____ This is the process of a solid becoming a liquid.
The Water Cycle

Fill in the blanks.

<table>
<thead>
<tr>
<th>cirrus clouds</th>
<th>cumulus evaporates</th>
<th>stratus vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>condenses</td>
<td>precipitation</td>
<td>water cycle</td>
</tr>
</tbody>
</table>

Water moves from the Earth to the atmosphere and back again. This path is called the _______ water cycle _______. Water changes to a gas, or _______ evaporates _______ , from the surface of oceans, lakes, and other places. Water _______ vapor _______ rises into the air and cools. Then it _______ condenses _______ onto tiny particles of dust and forms _______ clouds _______ .

There are three main types of clouds. Puffy white clouds are called _______ cumulus _______ clouds. Low, layered clouds are called _______ stratus _______ clouds. Wispy clouds high in the sky are called _______ cirrus _______ clouds. Eventually, the water in clouds falls back to Earth as _______ precipitation _______ . The different types of precipitation include rain, snow, sleet, and hail.
Tracking the Weather

Use your textbook to help you fill in the blanks.

What are air masses and fronts?

1. A large region of air with nearly the same properties throughout is called a(n) _____________.

2. Many air masses form near the _______ poles ________

3. The boundary between two air masses is called a(n) _______ front ________.

4. A warm air mass that pushes into a cold air mass is called a(n) _______ warm front ________.

5. A cold air mass that pushes under a warm air mass is called a(n) _______ cold front ________.

6. Two air masses that are not moving into each other form a(n) _______ stationary front ________.

What does a weather map show?

7. Weather maps show weather patterns. For example, lines of half circles or triangles show the locations of _______ fronts ________.
8. Predicting weather conditions is called ______ forecasting.

9. In the United States, fronts tend to move from ______ west ______ to ______ east ______.

10. Scientists use special instruments, such as ______ computers ______ and ______ satellites ______, to predict the weather.

**What are the signs of severe weather?**

11. The sound made when lightning quickly heats the air around it is called ______ thunder ______.

12. Thunderstorms can give rise to spinning winds that are called ______ tornadoes ______ when they hit the ground.

13. Very wide storms that form over warm ocean water are called ______ hurricanes ______.

**Critical Thinking**

14. Why do you think the weather usually becomes cool and clear after a severe thunderstorm?

Possible answer: I think it becomes cool and clear after a severe thunderstorm because the warm air is gone. Severe thunderstorms occur when a cold air mass moves in quickly and pushes under a warm air mass. The warm, moist air is pushed upward, and thunderclouds form. After the storm, the cold air mass settles over the area, so the weather is cooler.
Tracking the Weather

Match the correct word with its description.

<table>
<thead>
<tr>
<th>cold</th>
<th>hurricanes</th>
<th>tornadoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>forecast</td>
<td>mass</td>
<td>warm</td>
</tr>
<tr>
<td>front</td>
<td>thunderstorm</td>
<td></td>
</tr>
</tbody>
</table>

1. The boundary between two air masses is called a(n) _________ front _________.

2. Meteorologists study weather patterns and maps so that they can predict or _________ forecast _________ the weather.

3. If a front is fast-moving and bringing stormy weather, then it is a(n) _________ cold _________ front.

4. A large region of air with nearly the same temperature and water vapor throughout is an air _________ mass _________.

5. A(n) _________ warm _________ front is formed when warm air pushes into cold air and brings light, steady rain.

6. Although these very wide storms from over the ocean, _________ hurricanes _________ can also cause severe damage on land.

7. Heavy rain and lightning warn of an approaching _________ thunderstorm _________.

8. Rotating columns of air form _________ tornadoes _________ that can reach speeds of 400 km (250 mi) per hour.
The weather pattern on the ground depends on what is happening in the air. The body of air that slowly passes over a wide area of water or land is called a(n) ____________. It takes on the characteristics of the area in which it forms. For example, cold, dry, air masses form over ____________, close to the ____________. Warm, moist air masses form over ____________, close to the ____________. 

The place where two different air masses meet is called a(n) ____________. A cold air mass pushing under a warm air mass is called a(n) ____________. A warm air mass pushing into a cold air mass is called a(n) ____________. 

To forecast the weather, scientists locate fronts and track how they are moving.
Hurricane Season

Read the passage in your textbook. On the lines below, write the information that lets you know when and where hurricanes occur.

Hurricanes develop at sea. They usually happen in the Atlantic Ocean and northeast Pacific Ocean from June through November.

Write About It
Fact and Opinion
1. What technologies help scientists study hurricanes?
2. What do you think would happen during a hurricane in your neighborhood?

1. Scientists use satellites, Doppler radar, and buoys to gather information. Scientists feed this data into supercomputers to create a model of the hurricane.

2. Students in hurricane areas should be aware of local disaster plans. Students who live outside of hurricane-prone areas should be made aware of their local emergency procedures.
Fill in the Fact and Opinion graphic organizer. Then, answer the question.

<table>
<thead>
<tr>
<th><strong>Fact</strong></th>
<th><strong>Opinion</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricanes usually happen in the <strong>Atlantic</strong> and <strong>Pacific</strong> oceans.</td>
<td>The National Hurricane Center in <strong>Miami, Florida</strong>, thinks there will be more hurricanes this year than last year.</td>
</tr>
<tr>
<td>There must be certain <strong>conditions</strong> for a hurricane to form.</td>
<td>The temperature of the ocean water isn’t <strong>warm</strong> enough for a hurricane to form until late June.</td>
</tr>
<tr>
<td>Hurricanes are storms that bring violent winds, large <strong>waves</strong>, <strong>floods</strong>, and lots of <strong>damage</strong>.</td>
<td>Violent <strong>winds</strong> may knock down trees, and large <strong>waves</strong> may cause <strong>floods</strong>.</td>
</tr>
<tr>
<td>Data about hurricanes comes from <strong>buoys</strong>, <strong>satellites</strong>, <strong>Doppler radar</strong>, and supercomputers.</td>
<td>People tell what they <strong>remember</strong> about hurricanes.</td>
</tr>
</tbody>
</table>

1. Why would a prediction be considered an opinion rather than a fact?

   Even though a prediction may be based on facts, it also includes a person’s thoughts and feelings.
Climate

Use your textbook to help you fill in the blanks.

What is climate?

1. The pattern of seasonal weather that happens in an area year after year is called ___________ climate.

2. Important factors that define climate are humidity, wind, ___________ precipitation and ___________ temperature.

3. Temperate climates often have four ___________ seasons.

4. The types of ___________ crops that farmers can grow depend on climate.

What determines climate?

5. The thin lines that run east and west across some maps are lines of ___________ latitude.

6. Latitude is a measure of how far a place is from the ___________ equator and increases as you move north or south.

7. The temperature differences between low and high latitudes cause ___________ global winds.

8. Global winds are winds that move between the ___________ equator and the ___________ poles.
9. Warm air near the equator _______ rises _______ and moves toward the poles; cold air near the poles _______ sinks _______ and moves toward the equator.

10. A directed flow of a gas or liquid is called a(n) _______ current _______.

11. Water heats and cools more _______ slowly _______ than land does.

12. Climates near the ocean are cloudier and _______ rainier _______ than regions farther inland.

**How do mountains affect climate?**

13. The climate at the base of a mountain is always _______ warmer _______ than the climate at the peak.

14. As a(n) _______ air mass _______ travels over a mountain, it dries out. So the _______ climate _______ on one side will be wetter than the climate on the other side.

**Critical Thinking**

15. What do you think the climate would be like if you lived at the base of a mountain near the ocean?

Possible answer: The climate at the base of a mountain is warmer than the peak. The climate near the ocean is more humid and rainy. I think the climate at the base of the mountain would be very warm, moist, rainy, and humid.
**Climate**

Match the correct letter with the description.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>altitude</td>
<td>d.</td>
</tr>
<tr>
<td>b.</td>
<td>climate</td>
<td>e.</td>
</tr>
<tr>
<td>c.</td>
<td>climate region</td>
<td>f.</td>
</tr>
</tbody>
</table>

1. _____ **b** the characteristic weather pattern of a region over the course of several years
2. _____ **f** a measure of how far a place is from the equator
3. _____ **c** an area with the same climate throughout
4. _____ **g** a landform that can separate two different types of climates
5. _____ **a** a measure of how high a place is above sea level
6. _____ **h** the directed flow of water over long distances through the ocean
7. _____ **e** winds that circulate the air between the equator and the poles
8. _____ **d** where the latitude is set at zero degrees
Climate

Fill in the blanks.

<table>
<thead>
<tr>
<th>altitude</th>
<th>latitude</th>
<th>precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>climate</td>
<td>land</td>
<td>temperatures</td>
</tr>
<tr>
<td>degrees</td>
<td>polar</td>
<td>tropical</td>
</tr>
</tbody>
</table>

The weather in a particular region can be averaged over a long period of time. This is called the \[\text{climate}\] , and farmers depend on it to grow their crops. Average yearly \[\text{temperatures}\] and \[\text{precipitation}\] define the climate of a region.

Areas on the equator have a(n) \[\text{latitude}\] of zero degrees and have \[\text{tropical}\] climates. Latitude at the North and South Poles is 90 \[\text{degrees}\] , and they have \[\text{polar}\] climates.

Air temperature decreases with \[\text{altitude}\] , so higher areas have cooler climates than lower areas. Water warms and cools more slowly than \[\text{land}\] does. This is why areas near the ocean usually have milder climates than inland areas.
Weather and Climate

Circle the letter of the best answer.

1. Which tool is used to measure air pressure?
   a. hygrometer
e   b. anemometer
c   c. barometer
d   d. thermometer

2. The atmosphere is made mostly of nitrogen and
   a. oxygen.
e   b. carbon dioxide.
c   c. water vapor.
d   d. hydrogen.

3. Which is the lowest layer of the atmosphere?
   a. stratosphere
e   b. thermosphere
c   c. ionosphere
d   d. troposphere

4. Humidity is a measure of
   a. the weight of the air.
e   b. the amount of water vapor in the air.
c   c. precipitation.
d   d. how hot or cold the air is.

5. A process during which a liquid changes into a gas is called
   a. condensation.
e   b. freezing.
c   c. evaporation.
d   d. melting.

6. Dew forms on grass when water vapor from the air
   a. condenses.
e   b. evaporates.
c   c. melts.
d   d. freezes.

7. Wispy clouds that form high in the sky are called
   a. cumulus clouds.
e   b. stratus clouds.
c   c. fog.
d   d. cirrus clouds.

8. An air mass that forms over tropical ocean water will be
   a. warm and dry.
e   b. cold and dry.
c   c. warm and moist.
d   d. cold and moist.
Circle the letter of the best answer.

9. A cold air mass pushing under a warm air mass is called a(n)  
   a. warm front.  
   b. cold front.  
   c. stationary front.  
   d. occluded front.

10. Fronts in the United States tend to move from  
    a. west to east.  
    b. east to west.  
    c. north to south.  
    d. south to north.

11. The widest type of storm is called  
    a. tornado.  
    b. thunderstorm.  
    c. winter storm.  
    d. hurricane.

12. Global winds are caused by  
    a. temperature differences between high and low latitudes.  
    b. temperature differences between high and low altitudes.  
    c. ocean currents.  
    d. mountain ranges.

13. Which of the following will cause a climate to be cooler?  
    a. lower altitude  
    b. higher altitude  
    c. lower latitude  
    d. ocean current from the equator

14. Where does the latitude measure 0°?  
    a. North Pole  
    b. South Pole  
    c. equator  
    d. polar current

15. Which of the following is a measure of the weight of air pressing down on an area?  
    a. air pressure  
    b. temperature  
    c. precipitation  
    d. humidity
The Solar System and Beyond

Use the facts you have learned from the chapter to fill in the concept map.

**The Universe**

The universe is made up of 100 billion **galaxies**, each with 200 billion **stars**. Stars are glowing balls of gases.

**The Solar System**

The solar system includes an average star, **the Sun**, eight orbiting **planets**, many **moons**, and smaller bodies, such as **asteroids** and **comets**.

**Earth**

Earth and its Moon revolve around the **Sun** once each year. Earth is tilted on its **axis**.

**The Moon**

As the Moon **revolves** around Earth about once every **29 days**, it changes **phases**.
Earth and Sun

What causes day and night?

1. Earth completes one rotation on its ______ axis every __________ 24 ________ hours.

2. As Earth ______ rotates , the Sun appears to rise in the ______ east ________ and set in the ______ west ________.

3. The stars, Moon, and planets appear to move across the sky each night because of Earth’s ______ rotation ________.

4. At dawn and dusk, shadows are ______ long ________, and at midday, they are ______ short ________.

What causes seasons?

5. Each year, Earth completes one ______ revolution ________ around the Sun.

6. In June, the North Pole is tilted ______ toward ________ the Sun, so sunlight hits the Northern Hemisphere at a(n) ______ steeper ________ angle.

7. In summer, light is more ______ intense ________ than it is in winter.

8. In December, the North Pole is tilted ______ away from ________ the Sun, so sunlight hits the Northern Hemisphere at a(n) ______ low ________ angle.
9. When it is winter in the Northern Hemisphere, it is ___________ in the Southern Hemisphere.

How does the Sun’s apparent path change over the seasons?

10. In northern Alaska, summer nights are ___________ short, but during winter the sun hardly ___________ appears.

11. The Sun rises ___________ higher in the sky in summer than it does in winter.

12. Near the equator, the Sun’s apparent path changes ___________ less during the year than at higher latitudes.

13. The Sun’s path repeats itself every year, so it is possible to predict the time the sun will ___________ rise and ___________ set.

Critical Thinking

14. What do you think would be different if Earth rotated and revolved in the opposite direction? What would stay the same?

Possible answer: I think the Sun would rise in the west and set in the east. The seasons would follow in the same order.
Earth and Sun

Match the correct word with its description. Write the letter of the word in the space provided.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. apparent</td>
<td>b. axis</td>
<td>c. hemisphere</td>
<td>d. orbit</td>
<td>e. revolution</td>
</tr>
<tr>
<td>f. rotate</td>
<td>g. seasons</td>
<td>h. shadows</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. _____c_____ the northern or southern half of Earth
2. _____b_____ an invisible line that runs through the middle of an object
3. _____f_____ what Earth does every 24 hours on its axis
4. _____d_____ the path Earth takes around the Sun, or the path the Moon takes around Earth
5. _____e_____ Earth’s complete travel around the Sun
6. _____g_____ what occurs because Earth orbits the Sun on a tilted axis
7. _____a_____ the type of “motion” of the Sun as it rises in the east and sets in the west
8. _____h_____ what changes during the day but always points away from the Sun
Earth and Sun

Fill in the blanks.

<table>
<thead>
<tr>
<th>axis</th>
<th>higher</th>
<th>pattern</th>
<th>rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>lower</td>
<td>poles</td>
<td>seasons</td>
</tr>
<tr>
<td>equator</td>
<td>path</td>
<td>revolution</td>
<td>Sun</td>
</tr>
</tbody>
</table>

Earth completes a spin every 24 hours. This rotation causes day and night. It is day on the part of Earth facing the Sun, and in 12 hours, it will be night.

Earth also completes a revolution around the Sun each year. Because Earth is revolving on a tilted axis, there are seasons. During the summer, the Sun rises higher in the sky and earlier in the day. During the winter, the Sun is lower in the sky. Near the equator, the temperature and the Sun’s apparent path change very little. Near the poles, the Sun has a shorter apparent path but the same pattern. Scientists use this information to predict the times the Sun will rise and set.
Without the Sun

Write About It

Fictional Story Write your own story about what would happen if sunlight could not reach Earth.

Getting Ideas
Students’ answers will vary. Sample answer:

First
Planet Mungo was in conflict with Earth.

Next
Sunlight has been blocked from Earth.

Last
The High Global Commission met to discuss the problem.

Planning and Organizing

A good story has characters, a setting, and a plot. Justin wrote three notes to plan his story. Write Character next to the note that mainly describes the character. Write Plot next to the note that mainly describes the plot. Write Setting next to the note that mainly describes the setting.

Note 1. Setting It is the year 5002, and total darkness has covered Planet Earth.

Note 2. Character Professor Jamison is a scientist. Her specialty is the Sun.

Note 3. Plot Professor Jamison and her staff are trying to find out why Earth is suddenly in total darkness.
Revising and Proofreading

Here are some sentences that Justin wrote. He needs to include descriptive details. Choose a word from the box. Write it on the line.

| black   | brilliant | chilly | total |

At first, there was a hint of darkness. The air became

___________. Then, suddenly, there was

__________ darkness. The sky had been a

__________ blue. Now it was as ___________ black

as the darkest ink.

Drafting

Begin your story. Start with an exciting sentence to get the reader interested.

Sample sentence: Darkness suddenly fell on Earth like a blanket.

Continue your story. Use a separate piece of paper. Include details that tell about the main character and the setting. Make sure your story tells what would happen if sunlight didn’t reach Earth.

Now revise and proofread your writing. Ask yourself:

- Did I write an interesting beginning, middle, and end?
- Did I describe the characters and the setting?
- Did I correct all mistakes?
Earth and Moon

What is the Moon like?

1. Earth’s closest neighbor in space is the _______ Moon _______.
2. Moonlight is reflected light from the _______ Sun _______.
3. The Moon has _______ rocks _______ similar to those on Earth, but no _______ air _______ or _______ water _______.
4. Temperatures on the Moon can be both _______ hotter and colder _______ than any place on Earth.
5. The Moon’s surface is covered by _______ craters _______ made by _______ meteoroids _______.
6. When meteoroids enter Earth’s atmosphere, they become hot and _______ burn _______ before they hit Earth’s surface.

What are the phases of the Moon?

7. The Moon orbits Earth once in just over _______ 29 _______ days.
8. At any given time, the Sun lights _______ half _______ of the Moon.
9. As the Moon orbits Earth, we see different parts of it lit as it cycles through all of its _______ phases _______.
10. The Moon’s _______ gravity _______ causes _______ tides _______, the daily rise and fall of the ocean’s surface.
**What is an eclipse?**

11. A shadow cast by Earth or the Moon is a(n) __________ _________.

12. Earth casts a shadow on the Moon during a(n) __________ __________ eclipse.

13. A lunar eclipse happens when Earth is directly between _________ the Sun _________ and _________ the Moon _________ .

14. The Moon casts a shadow on Earth during a(n) __________ __________ eclipse.

15. A solar eclipse happens only when there is a(n) _________ _________.

16. All of the Sun’s light is blocked during a(n) _________ total solar eclipse _________.

**Critical Thinking**

17. Which do you think occurs more often, a partial solar eclipse or a total solar eclipse? Explain your reasoning.

Possible answer: I think a partial solar eclipse occurs more often than a total solar eclipse. For a total solar eclipse to occur, Earth, the Moon, and the Sun must line up exactly in a straight line to totally block the Sun. More often, their alignment is not exactly in a straight line, which creates a partial solar eclipse.
Earth and Moon

Use the words from the word box to fill in the blanks.

<table>
<thead>
<tr>
<th>crater</th>
<th>meteoroids</th>
<th>phases</th>
<th>tides</th>
</tr>
</thead>
<tbody>
<tr>
<td>lunar eclipse</td>
<td>new Moon</td>
<td>solar eclipse</td>
<td>waning Moon</td>
</tr>
</tbody>
</table>

1. The Moon’s gravity causes _______ tides _______.
2. The apparent shapes of the Moon in the sky are called its _______ phases _______.
3. The Moon casts a shadow on Earth during a(n) _______ solar eclipse _______.
4. A hollow pit in the ground is called a(n) _______ crater _______.
5. When the lighted side of the Moon faces away from Earth, it is called a(n) _______ new Moon _______.
6. Large rocks that fall from space are called _______ meteoroids _______.
7. When less and less of the lighted side of the Moon becomes visible each night, it is a(n) _______ waning Moon _______.
8. Earth casts a shadow on the Moon during a(n) _______ lunar eclipse _______.
Earth and Moon

Fill in the blanks.

<table>
<thead>
<tr>
<th>Earth</th>
<th>last-quarter</th>
<th>shadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>first-quarter</td>
<td>new Moon</td>
<td>three-fourths</td>
</tr>
<tr>
<td>full-Moon</td>
<td>one-fourth</td>
<td></td>
</tr>
</tbody>
</table>

The Moon orbits Earth once every 29 days. When the Moon and the Sun are on the same side of Earth, the part of the Moon that is in \underline{shadow} faces Earth. This is the \underline{new Moon} phase. In about a week, the Moon has completed \underline{one-fourth} of its orbit. This is called the \underline{first-quarter}.

About a week later, Earth is between the Moon and the Sun. This is called the \underline{full-Moon} phase. In another week, the Moon has completed \underline{three-fourths} of its orbit and only half of the lighted side can be seen. This is the \underline{last-quarter} phase. During a solar eclipse, the Moon casts a shadow on \underline{Earth}. During a lunar eclipse, Earth casts a shadow on the Moon.
The Solar System

What is the solar system?
1. Each planet revolves around the Sun in an orbit shaped like a(n) _______ ellipse, a slightly flattened circle.

2. Newton discovered that the balance between gravity and _______ inertia keeps the planets in orbit.

3. In the 1500s, _______ Copernicus proposed that the planets revolve around the Sun.

How do we learn about the solar system?
4. Telescopes make far way objects seem _______ closer.

5. In the 1960s, rockets from NASA took astronauts into _______ space.

6. The United States worked with other countries to build the _______ International Space Station, which can stay in space for a long time.

7. An unmanned spacecraft that carries data-recording equipment into space is called a(n) _______ probe.

What are the rocky planets?
8. Earth, Mars, _______ Mercury, and Venus are closest to the Sun and are called the rocky planets.

9. The atmosphere of Venus is made of _______ carbon dioxide.
What are the other planets?

10. The four outer planets lie beyond _______ Mars _______.

11. All of the outer planets are made mostly of hydrogen and _______ helium _______.

12. The largest planet is _______ Jupiter _______, and the next-largest is _______ Saturn _______.

What else is in the solar system?

13. When comets get close to the Sun, they form a(n) _______ tail _______.

14. Most asteroids lie in a belt between _______ Mars _______ and _______ Jupiter _______.

Critical Thinking

15. What other planet would you like to live on? What do you think would be the hardest thing to get used to?

Possible answer: I would like to live on Jupiter. It’s the biggest planet, and its atmosphere is divided into color bands. I think the hardest thing to get used to would be that the winds in each band blow in a different direction.
The Solar System

What am I?

Choose a word from the word box below that answers each question. Write the letter of the word in the space provided.

a. asteroid  
b. comet  
c. gravity  
d. meteor  
e. meteorite  
f. planet  
g. solar system  
h. telescope

1. __g____  I am the Sun and all of the objects that orbit it. What am I?
2. __f____  I am one of the largest objects orbiting the Sun. What am I?
3. __c____  I am an invisible pulling force that keeps the planets in orbit around the Sun. What am I?
4. __h____  I can make distant objects appear to be closer. What am I?
5. __b____  I am a chunk of ice mixed with rocks and dust. I travel around the Sun in a long, narrow orbit. What am I?
6. __a____  I am made of chunks of rock or metal. I lie in a belt between Mars and Jupiter. What am I?
7. __d____  I am a meteoroid that falls into Earth’s atmosphere and burns up. What am I?
8. __e____  I am a meteoroid that strikes Earth’s surface. What am I?
The Solar System

Fill in the blanks.

<table>
<thead>
<tr>
<th>comets</th>
<th>gases</th>
<th>Neptune</th>
<th>rocky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>gas giants</td>
<td>planets</td>
<td>Venus</td>
</tr>
<tr>
<td>ellipses</td>
<td>Jupiter</td>
<td>rock</td>
<td></td>
</tr>
</tbody>
</table>

The solar system consists of an average star, called the Sun, and all of the objects that revolve around it. These include eight __________ planets, many moons, and several smaller bodies, such as asteroids and __________ comets.

The __________ rocky planets are Earth, Mercury, __________ Venus, and Mars. They are closer to the Sun and are made mostly of __________ rock. The __________ gas giants include __________ Jupiter, Saturn, Uranus, and __________ Neptune. All of these are made mostly of __________ gases. The orbits of the planets are shaped like __________ ellipses. Earth is the only planet in our solar system that has what living things need to survive.
To the Moon!

How have scientists explored our solar system? What scientists learn about the Moon may help them explore planets and other solar system objects.

Write About It

Main Idea and Details Reread the introduction and the captions on the time line. Then write a paragraph that explains the main idea and details of this article. Be sure to include facts and examples in your paragraph.

Main Idea and Details

Fill in the Main Idea and Details Chart using information you find in the introduction and captions of the reading feature.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists have invented telescopes and space probes to explore the solar system.</td>
<td>In 1957, Sputnik became the first spacecraft to travel in space.</td>
</tr>
<tr>
<td></td>
<td>In 1959, Luna 1 approached the Moon, Luna 2 landed on the Moon, and Luna 3 sent back pictures.</td>
</tr>
<tr>
<td></td>
<td>Four hundred years ago, the telescope was invented and was used to observe the planets.</td>
</tr>
<tr>
<td></td>
<td>In 1969, the Apollo 11 mission was the first to land a person on the Moon.</td>
</tr>
<tr>
<td></td>
<td>In 1972, Apollo 17 was the last manned mission to the Moon.</td>
</tr>
</tbody>
</table>
Planning and Organizing

Answer these questions in more detail.

1. What was the first spacecraft to travel in space, and when was it launched?
   In 1957, Sputnik became the first spacecraft to travel in space.

2. What spacecraft was the first to land a person on the Moon, and when did this happen?
   In 1969, Apollo 11 became the first mission to land a person on the Moon.

3. What was the last manned spacecraft to travel to the Moon, and when was it launched?
   The last manned spacecraft to travel to the Moon was Apollo 17 in 1972.

Drafting

Explain how people first learned about the far side of the Moon.
People first learned about the far side of the Moon in 1959, when Luna 3 took pictures of it and sent them back to Earth.

Are scientists still studying the Moon? Why?
Yes. NASA plans to send expeditions back to the Moon, because they want to find out what it takes to live in its extreme environment.
Stars and Constellations

What are stars?

1. The closest star to Earth is ________ the Sun _________. It is ________ 150 million ________ kilometers away from Earth.

2. The Sun is a(n) ________ average ________-sized star.

3. Red stars and orange stars are ________ cooler ________ than the Sun, and blue stars and white stars are ________ warmer ________ .

4. The Sun will glow for ________ five billion ________ more years.

5. Scientists measure the distance of stars from Earth in ________ light-years ________ .

6. Throughout the universe, stars are found in large groups called ________ galaxies ________ .

What are constellations?

7. Because of Earth’s ________ orbit ________ , we see different constellations.

8. The constellations ________ appear ________ to move across the sky throughout the year.

9. The night sky looks different in the ________ Northern Hemisphere ________ than it does in the ________ Southern Hemisphere ________ .
LESSON

10. Once there were no clocks and people used constellations to tell _______________ time.

11. Long ago, farmers used constellations to tell them when to plant or _______________ harvest crops.

12. Sailors used constellations to _______________ steer at night.

What is the Sun like?

13. The Sun gives off energy in the form of _______________ light and _______________ heat.

14. The Sun provides the energy needed by almost all of Earth’s _______________ living things.

15. The Sun’s energy powers _______________ winds, _______________ ocean currents, and the water cycle.

Critical Thinking

16. Do you think it is possible to get a sunburn on a cloudy day?

Possible answer: Yes, I think it is possible to get a sunburn on a cloudy day. As long as it is daylight, our part of Earth is facing the Sun, and the Sun is giving off light energy as well as heat. Even though the clouds may block a little bit of the sunlight, our skin is still exposed.
Stars and Constellations

Use the words in the box to fill in the sentences and the crossword puzzle.

<table>
<thead>
<tr>
<th>constellation</th>
<th>galaxy</th>
<th>Orion</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross</td>
<td>light</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Across**

3. A constellation visible from the Southern Hemisphere is called the Southern **Cross**.

5. A group of stars in the sky forms a(n) **constellation**.

7. The closest star to Earth is the **Sun**.

**Down**

1. The distance light travels in a year is called a(n) **light-year**.

2. A large group of stars is called a(n) **galaxy**.

4. A constellation only visible in winter is **Orion**.

6. A hot, glowing sphere of gases is a(n) **star**.

---

**Crossword Puzzle**

```
 1. L I G H T
 2. G A R
 3. C R O S S
 4. O R I O N
 5. C O N S T E L L A T I O N
 6. T A X R
 7. S U N
```

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Stars and Constellations

Fill in the blanks.

<table>
<thead>
<tr>
<th>galaxies</th>
<th>Hemispheres</th>
<th>reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>blue or white</td>
<td>light-years</td>
<td>Sun</td>
</tr>
<tr>
<td>constellation</td>
<td>orange or red</td>
<td></td>
</tr>
</tbody>
</table>

Each star in the sky is an enormous, hot, glowing sphere of gases. Unlike planets that reflect light, stars emit their own light. The Sun is the closest star to Earth. It is average in temperature, so it is yellow. Hotter stars are blue or white, and cooler stars are orange or red. The distance of a star from Earth is measured in light-years. Stars are found in large groups called galaxies.

A group of stars that form a pattern in the sky is called a(n) constellation. Some of these are only visible at certain times of the year, while others are only visible from either the Northern or Southern Hemispheres. Constellations help us locate stars in the sky.
The Solar System and Beyond

Circle the letter of the best answer.

1. When the North Pole is tilted toward the Sun, it is
   a. summer in the Northern Hemisphere.
   b. winter in the Northern Hemisphere.
   c. daytime in the Northern Hemisphere.
   d. nighttime in the Northern Hemisphere.

2. In June, the South Pole has
   a. almost 24 hours of daylight.
   b. almost 24 hours of darkness.
   c. 12 hours of daylight and 12 hours of darkness.
   d. 6 hours of daylight and 18 hours of darkness.

3. The Sun appears to move from east to west because, when looking down on the North Pole, Earth
   a. revolves counterclockwise.
   b. revolves clockwise.
   c. rotates counterclockwise.
   d. rotates clockwise.

4. When is a shadow the longest?
   a. noon in summer
   b. dawn in summer
   c. noon in winter
   d. dawn in winter

5. When Earth is between the Moon and Sun, we see a
   a. half Moon.
   b. full Moon.
   c. new Moon.
   d. gibbous Moon.

6. When half of the lighted side of the Moon is seen, we see a
   a. new Moon.
   b. quarter Moon.
   c. full Moon.
   d. crescent Moon.

7. A partial solar eclipse occurs during the
   a. full-Moon phase.
   b. new-Moon phase.
   c. gibbous-Moon phase.
   d. half-Moon phase.
Circle the letter of the best answer.

8. Which of the following have scientists discovered?
   a. Some planets orbiting distant stars have living things on them.
   b. As of yet, no planets orbiting distant stars have been discovered.
   c. Some distant stars have planets orbiting them.
   d. Some planets in our solar system have living things on them.

9. Which of the following is the hottest planet?
   a. Mercury
   b. Venus
   c. Earth
   d. Mars

10. Which of the following is a chunk of ice mixed with rocks and dust?
    a. comet
    b. asteroid
    c. meteoroid
    d. meteorite

11. One light-year is about
    a. one trillion km.
    b. ten billion km.
    c. ten trillion km.
    d. one billion km.

12. Which planet rotates on its side?
    a. Saturn
    b. Uranus
    c. Mars
    d. Neptune

13. Besides Earth, which other planet has ice caps?
    a. Venus
    b. Mars
    c. Mercury
    d. Uranus

14. Which star is closest to Earth?
    a. Sirius
    b. Proxima Centauri
    c. Ross 154
    d. Sun
Mr. Mix-It
by Nicole Iorio
from *Time for Kids*

Read the Unit Literature feature in your textbook.

**Write About It**

**Response to Literature** What type of job would you like to have when you grow up? What skills does it require? Write a paragraph about your plans.

Possible answer: I would like to be a writer when I grow up. To be a good writer, I have to be a good speller. There are many different kinds of things to read, like books, magazines, comics, and newspapers. I could write about people, places, or things, like science and math. It could be real, nonfiction, or something that I thought up, fiction. I could also write about things that could only happen in my stories, like super heroes or magic school. That’s called fantasy or science fiction. No matter what I write about, I have to be able to make it interesting, so I also have to read a lot, too. I am going to go to college so I can learn more things to write about.
Properties of Matter

Complete the concept map with the information you learned about conserving Earth’s resources. Below each type of property in the concept map, fill in details or terms that relate to the type of property.

Properties of Matter

- states
  - solid
  - liquid
  - gas

- measurement
  - area
  - volume
  - density

- types of elements
  - metals
  - metalloids
  - nonmetals
Describing Matter

Use your textbook to help you fill in the blanks.

What is matter?
1. Anything that has ________ mass ________ and takes up ________ space ________ is matter.
2. The amount of matter in an object is the object’s ________ mass ________.
3. Matter takes up space, so matter has ________ volume ________.
4. Matter has many characteristics, or ________ properties ________, that can be used to describe it.
5. To measure mass scientists use a tool called a ________ balance ________.
6. The ability of a material to ________ dissolve ________ in liquids is another property of some types of matter.
7. Properties that can not be seen can still be ________ measured ________.
8. Wood floats on water because wood has the property of ________ buoyancy ________.

What are the states of matter?
9. The different forms that matter can take are called ________ states ________ of matter.
10. The state of matter that has a definite shape and a definite volume is the ________ solid ________ state.
11. The __________ particles in a solid are packed tightly, often in a regular pattern.

12. When matter in the __________ liquid state is moved from one container to another, it keeps the same volume but takes the shape of its container.

13. Oxygen is a(n) __________ gas because it takes the shape and volume of the container in which it is placed.

14. Particles in a(n) __________ gas move about freely.

What happens to the matter we use?

15. When you use something again, you __________ reuse matter.

16. Matter can end up in __________ landfills or __________ oceans.

17. Matter can be __________ recycled, or made into something else.

18. Metal, paper, plastic, and __________ glass can be recycled.

Critical Thinking

19. Do you think you can describe an object without using its properties?

Possible answer: No, I don't think so because anything that is used to describe an object is one of its properties. The shape, mass, volume, length, color, and other characteristics are all properties.
Describing Matter

Choose a word from the word box below that correctly fills in the blank.

| buoyancy | liquid | matter | solid |
| gas      | mass   | property | volume |

1. A canoe floats because of _______ buoyancy _______.
2. A large rock has more _______ volume _______ than a small rock.
3. Because a table has mass and takes up space, it contains _______ matter _______.
4. Something is a _______ liquid _______ if it has a definite volume but takes the shape of its container.
5. Color is one _______ property _______ of an object.
6. If copper is moved from a jar to a dish, it keeps the same shape and volume because copper is a(n) _______ solid _______.
7. The amount of matter in a basketball is the _______ mass _______ of the ball.
8. Oxygen in a car tire takes the shape and volume of the tire because oxygen is a(n) _______ gas _______.

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Describing Matter

Fill in the blanks.

buoyancy  liquid  properties  volume
gas      mass  solid

Matter can exist as three different states. If matter completely fills and takes the shape of its container, it is a(n) _______ gas _______. If matter always has the same shape and volume, even in different shaped containers, it is a(n) _______ solid _______. If a(n) _______ liquid _______ is poured from a long glass to a wide jar, it takes the shape of the jar but keeps the same volume.

Matter has characteristics, called _____ properties _______. One property is _______ mass _______, which describes the amount of matter something has. Another property is _______ volume _______, which describes how much space something takes up. Matter has the property of _______ buoyancy _______, which allows some objects to float on a liquid.
Juggling Matter

Write About It
Descriptive Writing Choose three or four items to describe. For example, you might choose a child’s toy, your pet’s toy, and a backpack. Write a paragraph describing them. Include the properties that make these objects useful to you.

Getting Ideas
Make a list of three or four items that have something in common. (For example, you might list the items in your desk.) Then after each item, write words that you think describe it.

1. model train—loud, hard, black, shiny
2. miniature trees—green, plastic
3. tracks—long, curvy, connected

Planning and Organizing
Make sure the details you include appeal to at least one of the five senses. Here are three sentences Valerie wrote. Write “sight,” “hearing,” “smell,” “taste,” or “touch” next to each sentence.

1. sight My shiny silver calculator is very thin.
2. touch I keep my pens and pencils in a soft case.
3. taste There is a peppermint in my pocket.
Drafting
Write a sentence to begin your description. Tell what you are writing about and why you are writing.
Possible answer: I have a large train set.

Now write your description on a separate piece of paper. Begin with the sentence you wrote above. Then describe each of the items. Include details that appeal to the senses, so that readers can picture the items. Tell how they are alike and different. At the end, tell how these items are part of a group.

Revising and Proofreading
Here is part of the description that Valerie wrote. Help her improve it by choosing a descriptive word from the box.

| clattering | five | large | wooden |

I have an old ______ wooden ______ desk at home that holds some of my most treasured items. It has ______ five ______ large ______ drawers.

When I open a drawer, there is a ______ clattering ______ sound as the items move around.

Now revise and proofread your writing. Ask yourself:
- Did I use describing words to tell about the items?
- Did I compare and contrast them?
- Did I correct all mistakes?
Measurement

Use your textbook to help you fill in the blanks.

How do we measure matter?

1. An inch, a mile, a pound, and a gallon are standard ___________ units of measurement.

2. A system of measurement that is based on units of 10 is the ____________ metric system ____________.

3. An object’s ____________ length is the number of units that fit across.

4. Any measurement made in square units, such as square centimeters (cm²), is a measurement of ___________ area ____________.

What is density?

5. The comparison of an object’s mass to its volume describes ___________ density ____________.

6. To find the density of an object ___________ divide ___________ its mass by its volume.

7. An object floats when its density is ___________ less ___________ than the density of the liquid or gas into which it is placed.

8. Heated air becomes ___________ less ___________ dense; cooler, denser air forces it upward.
9. The density of water is ___________ 1 g/cm³ while the density of cork is 0.24 g/cm³.

10. The density of an object affects its ___________ buoyancy ___________.

What is weight?

11. The measure of the pull of gravity from a planet on the mass of an object describes an object’s ___________ weight ___________.

12. Ounces and pounds are the ___________ English ___________ units for weight, and the ___________ newton ___________ is the metric unit for weight.

13. An object’s ___________ weight ___________ changes with gravity, but its ___________ mass ___________ stays the same.

Critical Thinking

14. Do you think that if a marshmallow and a marble are the same size, they would have the same mass, density, buoyancy, or volume?

   Possible answer: I think they would have the same volume. If they’re the same size, they take up the same space. A marble is hard and a marshmallow is spongy. The marble has more mass and more density than the marshmallow. The buoyancy force of a liquid will be greater on the marshmallow than the marble.
Measurement

Match the correct letter with the description.

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>area</td>
<td>d.</td>
<td>gravity</td>
<td>g.</td>
<td>newton</td>
<td>f. metric system</td>
</tr>
<tr>
<td>b.</td>
<td>balance</td>
<td>e.</td>
<td>length</td>
<td>h.</td>
<td>volume</td>
<td>i. weight</td>
</tr>
<tr>
<td>c.</td>
<td>density</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. ______ f a system of measurement based on the number 10
2. ______ e the number of units across an object
3. ______ i the effect of gravity on the mass of an object
4. ______ d the force that pulls any two objects toward each other
5. ______ c the mass of an object divided by its volume
6. ______ g the metric unit of weight
7. ______ a the number of square units on the surface of something
8. ______ h the amount of space that an object takes up
9. ______ b the tool used to measure mass
Measurement

Fill in the blanks.

<table>
<thead>
<tr>
<th>balance</th>
<th>height</th>
<th>metric system</th>
<th>weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>gram</td>
<td>length</td>
<td>newton</td>
<td></td>
</tr>
<tr>
<td>gravity</td>
<td>mass</td>
<td>volume</td>
<td></td>
</tr>
</tbody>
</table>

Measurement is a way of using numbers to compare objects. The amount of matter in an object describes its ______ ______. Mass is measured by using a(n) ______ ______. The unit in the ______ ______ that describes mass is the ______ ______. A measurement of the effect of the force of ______ ______ on the mass of an object is the ______ ______ of the object. The metric unit of weight is the ______ ______.

When the ______ ______ of a box-shaped object is multiplied by its width and ______ ______, its ______ ______ is found. The area of a flat surface can be calculated by multiplying its length by its width.
Classifying Matter

Use your textbook to help you fill in the blanks.

What are elements?

1. A material that contains only one type of matter is an element.
2. An element cannot be broken down into a simpler form.
3. Elements are “the building blocks of matter.”
4. An element is made of small particles, called atoms, each of which contains all of the properties of that element.
5. Elements are classified as metals, metalloids, and nonmetals.
6. An element that conducts electricity and can be hammered into a shape is a(n) metal.
7. Elements that have some, but not all, of the properties of metals are called metalloids.
8. Nitrogen is a(n) nonmetal because it does not contain any of the properties of a metal.

How are elements organized?

9. The scientist Dmitry Mendeleev organized the elements according to their properties.
10. The table that shows the elements arranged according to their properties is the **periodic table**.

11. Rows in the periodic table are called **periods**.

**How do scientists use the periodic table?**

12. Elements in the same **column**, such as potassium and sodium, have similar properties.

13. Scientists use the periodic table to predict how an element will behave or **react**.

14. Hydrogen reacts with, and forms, many **substances**.

15. Iron and two other metals in its row are **magnetic**.

16. Elements in the fluorine column react with elements in **column 1**.

**Critical Thinking**

17. Do you think that new elements can still be added to the periodic table of elements?

   **Possible answer:** Yes, I do. If a new element were discovered, it could be classified according to its properties. Any new elements could be added to the column that had the same properties.
Classifying Matter

Fill in the blank with the correct term. Then circle the term in the puzzle.

1. a material that contains only one type of matter: __________ element

2. a row in the periodic table: __________ period

3. a shiny element that conducts electricity: __________ metal

4. an element with some, but not all, properties of metal: __________ metalloid

5. elements are organized in a chart: __________ periodic table

6. an element with no properties of a metal: __________ nonmetal

7. the small particles that make up an element: __________ atoms
Classifying Matter

Fill in the blanks.

- conduct
- element
- metalloids
- metals
- nonmetals
- periodic table
- properties
- period

The thousands of materials that we use every day are made from just over 100 different types of matter. Each type of matter is called a(n) ____________ element. Elements are classified in a chart called the ____________ periodic table.

The periodic table organizes elements according to their ____________ properties. Each row is called a(n) ____________ period. Elements in the same column have similar properties. Elements are also grouped in the periodic table as metals, ____________ metalloids, and nonmetals. Metals are found on the left side of the periodic table. ____________ Nonmetals are found on the right side. Metalloids have some but not all properties of ____________ metals. Elements that are nonmetals have none of the properties of metals.
Meet Sisir Mondal

Read the passage in your textbook. Then use the Compare and Contrast graphic organizer to help you answer the questions.

**Compare and Contrast**

1. How are platinum and chromium alike?
   
   Both are metallic elements found in rocks.

2. How are platinum and chromium different?
   
   Platinum is a precious metal that is used in jewelry and catalytic converters in cars. Chromium is used in steel.
Write About It

Classify Read the article again. What does Sisir look for in the rocks he studies? How do you think Sisir classifies the rocks?

Details
List details about Mondal’s field work.
He studies layers of rocks, collects rock samples, studies rocks closely, and makes geologic maps.

List details about Mondal’s lab work.
He studies rocks closely, uses microscopes and other tools, and looks for metals in rocks.

Drafting
Use the details to explain how Mondal’s field and lab work are alike.
He studies rocks closely.

Use the remaining details to explain how Mondal’s field and lab work are different.
In the field, he studies layers of rocks, collects rock samples, and makes geologic maps. In the lab, he uses microscopes and other tools and looks for metals in rocks.
Properties of Matter

Circle the letter of the best answer.

1. The smallest particle of gold cannot be broken down into simpler substances. Gold is a(n)
   a. atom.
   b. element.
   c. nonmetal.
   d. noble gas.

2. What property is being measured when the unit of measurement is cm²?
   a. area
   b. length
   c. mass
   d. volume

3. A book keeps its shape and volume when it is moved from one bag to another. A book is a(n)
   a. gas.
   b. liquid.
   c. metal.
   d. solid.

4. What type of element is shiny and can be drawn into a wire?
   a. a metal
   b. a metalloid
   c. a noble gas
   d. a nonmetal

5. The noble gases in column 18 of the periodic table are all
   a. magnetic.
   b. nonmetals.
   c. metals.
   d. metalloids.

6. Which item makes up aluminum foil?
   a. a gas
   b. a metalloid
   c. a specific type of atom
   d. different kinds of atoms

7. Measurements of mass and volume can be used to find
   a. area.
   b. density.
   c. gravity.
   d. volume.
Circle the letter of the best answer.

8. The force that explains why wood floats on water is
   a. buoyancy.
   b. volume.
   c. gravity.
   d. mass.

9. When helium is moved from a tank to a balloon, its shape and volume change. Helium is a
   a. gas.
   b. liquid.
   c. metalloid.
   d. solid.

10. Gravity is stronger on Earth than it is on the Moon. On the Moon, an object’s
    a. mass is greater than on Earth.
    b. mass is less than on Earth.
    c. weight is greater than on Earth.
    d. weight is less than on Earth.

11. Which measurement should you make in order to find the amount of carpet you need to order to cover a floor?
    a. area
    b. length
    c. density
    d. volume

12. Which of the following is based on units of ten?
    a. density
    b. gravity
    c. the metric system
    d. the periodic table

13. All matter has
    a. mass and area.
    b. mass and volume.
    c. state and area.
    d. weight and volume.

14. When a certain state of bromine is moved from a bottle to a jar, its volume stays the same but its shape takes the shape of the jar. Bromine in this state is a(n)
    a. gas.
    b. liquid.
    c. metal.
    d. solid.
How Matter Changes

Use your textbook to help you fill in the blanks.

Combinations of Matter

Mixtures
are made up of two or more types of matter. Each type keeps its own chemical properties. Two types of mixtures are solutions and alloys.

Compounds
are made up of two or more types of elements. This new substance has its own properties. Two types of compounds are acids and bases.

Some mixtures can be separated on the basis of physical properties.

Mixtures can be separated using certain techniques.

Evaporating and then recondensing a liquid is called distillation.

Filtration separates liquids from solids.

Evaporation turns a liquid into a gas.
How Matter Can Change

Use your textbook to help you fill in the blanks.

What are physical changes?
1. A change that begins and ends with the same kind of matter is a **physical change**.
2. A physical change can be caused by cutting, crushing, tearing, bending or **stretching** matter.
3. When the surface of a lake freezes and becomes **solid**, the water beneath the ice is still a **liquid**.
4. Some signs of a physical change are changes in size, **shape**, or **position**.

How does matter change state?
5. When matter changes from one form to another, such as from a solid to a liquid, it goes through a change of **state**.
6. A change of state is caused by **heat (or energy)**.
7. The Sun’s energy can change a liquid to a gas during a process called **evaporation**.

What are chemical changes?
8. A change that produces new matter is a(n) **chemical change**.
9. A chemical change is also known as a chemical reaction.

10. A chemical change either ___________ gives off or ___________ uses ___________ energy.

11. Energy in a chemical change can be in the form of heat, ___________ , or ___________.

12. Some of the characteristics of a chemical change are the release of a(n) ___________ or a change in ___________ or smell.

What are other real-world changes?

13. Reshaping dough is a(n) ___________ , but baking it is a chemical change.

Critical Thinking

14. Do you think you would identify a change in texture as a chemical change or a physical change?

Possible answer: Chemical changes and physical changes can both result in a change in texture. I think I would identify it as a chemical change if there were also a change in color or taste, or if it gave off gas or a smell. I think I would identify it as a physical change if there were also a change in size, shape, position, or state.
How Matter Can Change

Choose a word from the word box below that correctly fills in the blank.

<table>
<thead>
<tr>
<th>change of state</th>
<th>compound</th>
<th>physical</th>
<th>tarnish</th>
</tr>
</thead>
<tbody>
<tr>
<td>chemical</td>
<td>evaporation</td>
<td>rust</td>
<td></td>
</tr>
</tbody>
</table>

1. When an ice cube melts into liquid water, it goes through a(n) _______ change of state.
2. Folding, cutting, chopping, and crushing are examples of a(n) _______ physical change.
3. A chemical reaction between iron and oxygen found in the air and in water forms a new substance called _______ rust.
4. A change in matter that results in new matter is a(n) _______ chemical change.
5. Energy from the Sun can change a liquid into a gas. The process is called _______ evaporation.
6. The result of two or more elements chemically combining to form a new substance is a(n) _______ compound.
7. When silver metal in a spoon reacts to sulfur in the air, a new substance, called _______ tarnish, is formed.
How Matter Can Change

Fill in the blanks.

<table>
<thead>
<tr>
<th>change of state</th>
<th>physical</th>
<th>substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>chemical</td>
<td>properties</td>
<td>sulfur</td>
</tr>
<tr>
<td>evaporation</td>
<td>rust</td>
<td>tarnish</td>
</tr>
<tr>
<td>iron</td>
<td>solid</td>
<td></td>
</tr>
</tbody>
</table>

Matter changes every day. A _______ physical _______ change is the simplest type of change, because the physical _______ properties _______ change but the type of matter remains the same. If water becomes a gas through _______ evaporation _______ , or if it freezes and becomes a _______ solid _______ , that is a _______ change of state _______ .

During a _______ chemical _______ change, a new _______ substance _______ forms. For example, when oxygen and _______ iron _______ combine, _______ rust _______ is formed. When silver combines with _______ sulfur _______ in the air, _______ tarnish _______ is formed. These are two common chemical changes.
Lady Liberty

Read the passage in your textbook.

Write About It

Sequence

1. Make a chart showing how the color of the Statue of Liberty has changed over time.
2. Use your chart to write a summary of those changes.

Reread the text. Find any words you think are time-order words and then write them on the lines below.

1. when it was built
2. twenty years after it was built
3. first
4. over-time
5. again
6. for a while

Can you think of any statues or monuments in your city that have changed color over time?

Possible answer: Large statues in Washington, DC; any locally famous statues, like William Penn in Philadelphia.
Sequence
Use the sequence-of-events chart to illustrate how the color of the Statue of Liberty has changed.

First
First, the statue was the color of a shiny new ________ penny _________.
Then, the statue turned from ________ red ________ to dark ________ brown _________.

Next
The dark brown color was caused by a ________ chemical reaction ________ called oxidation. During oxidation, ________ oxygen ________ in the air combined with the ________ copper ________ of the statue to form ________ copper oxide ________.

Last
Over time, ________ rainwater ________ and ________ carbon dioxide ________ reacted with the copper oxide. A new ________ compound ________, copper hydroxide, formed. Copper hydroxide gave the statue its ________ green color ________.

Summary
Use your chart to write a paragraph on a separate sheet of paper that summarizes the Statue of Liberty’s changes in appearance.
Mixtures

Use your textbook to help you fill in the blanks.

What is a mixture?

1. A physical combination of two or more kinds of matter is called a(n) ___________ mixture.

2. Each kind of matter in a mixture keeps its own ___________ properties.

3. Many everyday products, including the ___________ food you eat and the ___________ clothing you wear, are mixtures.

4. A mixture that is blended completely is called a(n) ___________ solution.

5. Salt water is a good ___________ conductor of electricity.

6. A solution might have ___________ properties that the original materials did not have.

7. A mixture of two or more metals or a metal and a nonmetal is called a(n) ___________ alloy.

How can you separate the parts of a mixture?

8. The materials in a mixture can be separated by using their ___________ physical properties.

9. Solids are often separated from a liquid by using a(n) ___________ filter.
10. Using a filter to separate a mixture is called _______ **filtration**.

11. A mixture containing certain metals can be separated using a(n) _______ **magnet**.

**How can you separate the parts of a solution?**

12. Solids can be separated from a solution by using _______ **evaporation**; the liquid part of the solution is lost to the air.

13. Liquid water can be collected from a solution of salt water by using _______ **distillation**.

**Critical Thinking**

14. How are mixtures useful in your everyday life?

   Possible answer: I use mixtures such as alloys. Alloys are mixtures of metals or metals and nonmetals. They may be stronger, harder, or more flexible than the original substances by themselves. Foods that are mixtures may taste better together than they do by themselves. Sometimes, a mixture is formed accidentally, like metal lost in the sand. The substances in a mixture keep their original physical properties, so a magnet can be used to separate the metal from the sand.
Mixtures

What am I?

Choose a word from the word box below that answers each question. Write the corresponding letter on the line.

| a. alloy | b. distillation | c. filter | d. filtration | e. mixture | f. solution |

1. _____ e  I am a combination of two or more types of matter in which each type of matter keeps its own chemical properties. What am I?

2. _____ f  I am a mixture in which substances are completely blended throughout the mixture. What am I?

3. _____ a  I am a solution of two or more metals. I can also be a solution of a metal and a nonmetal. What am I?

4. _____ c  I am a tool that can be used to separate the parts of some mixtures. I am often used to separate a solid from a liquid. What am I?

5. _____ b  I am a process used to separate a liquid solution by heating it and collecting the gas. What am I?

6. _____ d  I am the process used to separate parts of a mixture by using a mesh or screen. What am I?
Mixtures

Fill in the blanks.

<table>
<thead>
<tr>
<th>alloy</th>
<th>evaporation</th>
<th>solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>chemical properties</td>
<td>filter</td>
<td>physical properties</td>
</tr>
<tr>
<td>distillation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

People use mixtures every day. Each type of matter in a mixture keeps its own chemical properties. Parts of a mixture can be separated by using their physical properties. Two tools that can be used to separate a mixture are a magnet and a(n) filter. Filtration is used to separate a solid from a liquid.

Two substances can also be blended completely to form a(n) solution. When metals are blended together, they form a(n) alloy, which may be harder and stronger than the original materials. Solutions can be separated through evaporation, used to remove the solids, and distillation, used to remove the liquids. Mixtures and solutions can be separated because their parts have kept their own physical properties.
Compounds

Use your textbook to help you fill in the blanks.

What are compounds?

1. Not all combinations of __________________ elements can be separated physically.

2. Two or more elements can be combined chemically to form a substance called a(n) __________ compound.

3. A compound from sodium and chlorine that you might find on the dinner table is __________ table salt.

4. No amount of crushing can separate the __________ elements in table salt.

5. A common compound formed from hydrogen and oxygen is __________ water.

6. A common compound formed from iron and oxygen is __________ rust.

7. __________ Carbon, hydrogen, and oxygen combine to form sugar.

8. Silicon and oxygen combine to form __________ quartz, a hard mineral.

What are acids and bases?

9. Acids and __________ bases are compounds that react easily with other substances.

10. Some substances, like lemons and oranges, contain __________ weak acids.
11. Scientists use _______ litmus _______ paper to tell whether a substance is an acid or a base.

12. A(n) _______ base _______ is a substance that turns red litmus paper blue.

13. A(n) _______ acid _______ is a substance that turns blue litmus paper red.

14. When an acid and a base are _______ combined _______ , they react chemically.

15. Combining an acid and a base will form a _______ salt _______ and _______ water _______ .

16. Water _______ does not _______ turn litmus paper blue or red.

Critical Thinking

17. How do we use acids and bases around the house?

Possible answer: We can eat foods that contain weak acids like lemons and oranges. We use weak bases in soaps, detergent, and baking soda. Strong acids and bases are too dangerous for us to eat or use around the house.
Compounds

Match the correct word with the description.

<table>
<thead>
<tr>
<th>acid</th>
<th>compound</th>
<th>neutral</th>
<th>physically</th>
<th>base</th>
<th>litmus paper</th>
<th>opposites</th>
<th>water</th>
</tr>
</thead>
</table>

1. When two or more elements are chemically combined, a(n) ______ compound is formed.

2. Scientists identify acids and bases by using ______ litmus paper.

3. Lemon juice can be used in food and to clean because it is a weak ______ acid.

4. Not every substance is an acid or a base. Some substances, such as water, are ______ neutral.

5. Acids and bases have properties that are ______ opposite of one another.

6. A compound made from hydrogen and oxygen is ______ water.

7. Soap feels slippery and can be tested with red litmus paper because it is a(n) ______ base.

8. If elements have been chemically combined, they cannot be separated ______ physically.
Compounds

Fill in the blanks.

chemical reaction  hydrogen  oxygen
chemicals  litmus paper  substance

Matter is made of elements that have been joined together. When two or more elements are joined through a(n) chemical reaction, they form a new substance with new properties. Water is an example of a compound made of two gases: hydrogen and oxygen. When these two gases are joined, they produce a new substance—liquid water.

Acids and bases are substances that are present in many everyday products. Acids, bases, and neutral substances can be identified using litmus paper. Strong acids and bases are harmful chemicals. Weak acids and bases are used in food and soap.
How Matter Changes

Circle the letter of the best answer.

1. If a piece of paper changes in size or shape it most likely indicates that
   a. a chemical change has taken place.
   b. a physical change has taken place.
   c. a change of state has taken place.
   d. evaporation has taken place.

2. What type of change occurs when liquid water is cooled to make ice cubes?
   a. change of place
   b. change of shape
   c. change of state
   d. change in use

3. Which describes evaporation?
   a. gas changed into a liquid
   b. liquid changed into a gas
   c. liquid changed into a solid
   d. gas changed into a solid

4. The type of change that produces a new substance is a
   a. physical change.
   b. chemical change.
   c. change of state.
   d. change in place.

5. Iron and oxygen react chemically to form
   a. tarnish.
   b. dust.
   c. rust.
   d. heat.

6. Silver metal chemically reacts with sulfur in the air to form
   a. tarnish.
   b. dust.
   c. rust.
   d. heat.
7. What is the name of a mixture of two or more metals?
   a. alloy
   b. rust
   c. tarnish
   d. base

8. What process involves heating a solution until a gas forms, collecting the gas, and then cooling the gas back into a pure liquid?
   a. evaporation
   b. filtration
   c. solution
   d. distillation

9. A mesh or screen that allows for the separation of a solid from a liquid is a(n)
   a. evaporate.
   b. filter.
   c. distillate.
   d. solution.

10. The name of the process used to separate a solid from a liquid, such as separating spaghetti from water, is
    a. evaporation.
    b. distillation.
    c. filtration.
    d. solution.

11. A combination of two or more types of matter that keep their original chemical properties is called a(n)
    a. mixture.
    b. solution.
    c. alloy.
    d. chemical reaction.

12. What two types of substances have opposite properties and form a neutral solution when they are combined?
    a. acids and gases
    b. acids and bases
    c. bases and gases
    d. bases and water
Magnetic Migration
From Ranger Rick

Read the Unit Literature feature in your textbook.

Write About It
Response to Literature Have you taken a trip to a different place? Where did you go? How did you get there? Write about a trip you have taken. Be sure to include how you figured out the directions.

Possible answer: I live in Charlotte, North Carolina, and last summer, my family went to Philadelphia. We decided to take the train. We took food with us, but we also bought drinks and snacks on the train. Before we got on the train, my parents bought maps and schedules so we would know the stops.
Forces

Fill in the blanks in this concept map by using the information you have learned about forces.

Motion

is a change in the
position
of an object
and has speed,
velocity,
and sometimes
acceleration.

Forces

can start or
stop
motion, or they can
change
the direction of
motion. Forces include
friction
and
gravity.
Motion and Forces

Use your textbook to help you fill in the blanks.

What is motion?

1. Motion occurs when an object changes its location or its ________ position.

2. Words like left, ________ right ________, ________ above ________, below, east, and ________ west ________ give clues about position.

3. When you describe how far you walk by what you see along the way, those things are your ________ frame ________ of reference.

4. The word used to describe how far apart two points or places are is is ________ distance ________.

5. The ________ speed ________ of anything is the distance it has moved in a certain period of time.

6. Speed is a change in ________ distance ________ over time.

7. A moving object’s ________ velocity ________ describes its ________ speed ________ and the ________ direction ________ it moved.

How do forces affect motion?

8. You must apply a(n) ________ force ________ to put an object in motion or ________ stop ________ an object from moving.
9. Acceleration is any change in the speed or direction of a(n) moving object.

10. Any object is in a state of inertia until a force moves it or stops it.

11. Objects in motion can be slowed down or stopped by friction once they touch each other.

What is gravity?

12. The force that pulls objects together is called gravity.

13. The pull of gravity between two objects is affected by the amount of matter in each object and the distance between the objects.

Critical Thinking

14. Do you think you need a lot of force to change an object’s state of inertia?

Possible answer: An object in a state of inertia will not move or it will keep moving until a force acts on it. I think it depends on where I’m trying to move it. If I’m trying to push it uphill or stop it from going downhill, I would need a lot of force, because I’m working against gravity. If it’s on a flat surface, then it depends on how big it is and if there is any friction.
Lesson
Vocabulary

Motion and Forces

Match the correct word with the description.

<table>
<thead>
<tr>
<th>a. acceleration</th>
<th>b. force</th>
<th>c. friction</th>
<th>d. gravity</th>
<th>e. inertia</th>
<th>f. speed</th>
<th>g. time</th>
<th>h. velocity</th>
</tr>
</thead>
</table>

1. _______ the distance that an object moves in a certain amount of time
2. _______ can be used to determine speed if distance is known
3. _______ a change in the speed or direction of a moving object
4. _______ a push or a pull that can move a still object or stop a moving object
5. _______ the tendency of an object in motion to stay in motion, or an object at rest to stay at rest
6. _______ the type of force when the surfaces of two objects touch
7. _______ the force that pulls objects together
8. _______ the speed and direction in which an object is moving
Motion and Forces

Fill in the blanks.

<table>
<thead>
<tr>
<th>force</th>
<th>inertia</th>
<th>speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>friction</td>
<td>position</td>
<td>stop</td>
</tr>
<tr>
<td>gravity</td>
<td>rest</td>
<td>velocity</td>
</tr>
</tbody>
</table>

Objects do not move until a force acts on them. They have __________ inertia, the property that keeps an object at __________ rest or in motion. A(n) __________ force is required to __________ stop a moving object, or to put a stopped object in motion.

Two of the forces that affect motion are __________ gravity and __________ friction.

A moving object changes its __________ position, or location, in relation to surrounding objects. An object can move quickly or slowly, but the average __________ speed of an object is equal to the distance traveled divided by the time spent moving.

The speed and direction in which an object is moving is called its __________ velocity. A change in velocity is called acceleration.
Changing Motion

Use your textbook to help you fill in the blanks.

How do forces affect motion?

1. When you put a backpack on a desk, \( \text{gravity} \) pulls the backpack toward Earth.

2. The backpack on a desk does not move. The desk \( \text{pushes} \) up on the backpack with a force that is \( \text{equal} \) to the pull of gravity.

3. Forces that cancel each other out when acting on a single object are \( \text{balanced forces} \).

4. Forces that are not equal to each other are called \( \text{unbalanced forces} \).

5. Unbalanced forces cause a change in \( \text{motion} \); the \( \text{greater} \) force determines the direction of the motion.

6. Newtons are a measure of force in \( \text{metric} \) units.

How do forces affect acceleration?

7. The acceleration of an object is affected when the size of the \( \text{force} \) acting on it changes; acceleration is also affected by the \( \text{mass} \) of the object.
8. The greater the mass the greater the force needed to overcome inertia. 

9. If the same force is used on two objects, the object with less mass accelerates faster than the object with more mass.

How does friction affect motion?

10. Friction is a(n) force that works against motion.

11. The amount of friction depends on the surfaces involved.

12. To reduce friction on the moving parts of a bicycle, you can use oil.

Critical Thinking

13. How do you think firemen use forces and changing motion to slide down a pole?

Possible answer: I think firemen jump on the pole to change their state of inertia so they can start moving. They know gravity will pull them down the pole. If they have smooth clothing on and wrap their legs and arms around the pole, they’ll slide faster because there’s little friction.
Changing Motion

Choose a word from the word box below that correctly fills in the blank.

<table>
<thead>
<tr>
<th>balanced</th>
<th>friction</th>
<th>newtons</th>
<th>smooth</th>
</tr>
</thead>
<tbody>
<tr>
<td>force</td>
<td>mass</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. A(n) _______ rough _______ surface creates a lot of friction.

2. Forces that are equal in size and opposite in direction are called _______ balanced _______ forces.

3. Any push or pull is called a(n) _______ force _______.

4. Force is measured in units called _______ newtons _______.

5. A force that works against motion is _______ friction _______.

6. Forces that are not equal in size and are not opposite in direction are called _______ unbalanced _______ forces.

7. More force is needed to move an object with a large _______ mass _______.

8. A(n) _______ smooth _______ surface does not create much friction.
Changing Motion

Fill in the blanks.

<table>
<thead>
<tr>
<th>balanced forces</th>
<th>motion</th>
<th>speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>direction</td>
<td>newtons</td>
<td>unbalanced forces</td>
</tr>
<tr>
<td>friction</td>
<td>rough</td>
<td></td>
</tr>
</tbody>
</table>

An object in motion is affected by different forces. These forces, measured in units called ______ newtons, can keep an object in ______ motion or cause it to stop moving.

If forces are equal in size and move in opposite directions, they are called ______ balanced forces and do not cause a change in motion. If they are not equal in size and are opposite in ______ direction, they are called ______ unbalanced forces. They can affect an object’s direction, ______ speed, or both. The motion created by an unbalanced force is also affected by the type of surface under an object. A(n) ______ rough surface produces more ______ friction than a smooth surface. A smooth surface will increase motion and a rough surface will slow it down.
Wheels in Motion

Write About It

Explanatory Writing Research how the brakes on a bike work. Write a description that explains how friction helps the bike stop moving.

Getting Ideas
First find out how brakes work. Then fill out the chart below. Write the steps in the process.

<table>
<thead>
<tr>
<th>First</th>
<th>Press the brake level on your handlebars.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next</td>
<td>The cable tightens the brake.</td>
</tr>
<tr>
<td>Last</td>
<td>Friction between the brake and wheel makes the bike stop.</td>
</tr>
</tbody>
</table>

Planning and Organizing
Jada wrote three steps for her explanation. Put the steps in the correct order. Write 1, 2, and 3.

3 This causes friction between the brake and the wheel. It makes the bike come to a complete stop.
2 The brake cable attaches to the back wheel. When you squeeze the brake cable, it tightens the brake.
1 The handlebar brake lever is on the front handlebar. It is attached to the brake cable.
Revising and Proofreading
Here are some sentences that Jada wrote. Combine each pair. Use the word in parentheses. Put a comma before the word.

1. Don’t press the brakes quickly. You might topple over the front wheels. (or)
   
   Don’t press the brakes quickly, or you might topple over the front wheels.

2. Friction is created between the brake and the wheel. This causes the bike to come to a stop. (and)
   
   Friction is created between the brake and the wheel, and this causes the bike to come to a stop.

Drafting
Begin your explanation. Write a topic sentence. Tell what your explanation is about.

Sample sentence: The brakes on a bike use friction to make the bike stop.

Now write your explanation. Use a separate piece of paper. Start with the sentence you wrote above. Write easy-to-follow details to tell how the brakes on a bicycle work.

Now revise and proofread your writing. Ask yourself:

- Did I describe how the brakes on a bicycle work?
- Did I give clear, easy-to-follow details?
- Did I correct all mistakes?
Work and Energy

Use your textbook to help you fill in the blanks.

What is work?

1. Work is done when a force moves a(n) ________ object
   a certain ________ distance.

2. Any time you ________ push ________ or ________ pull ________
   to move an object, you do work.

3. Energy is the ability to do ________ work ________.

4. Stored ________ energy ________ with the future ability to
   do work is called ________ potential energy ________.

5. A moving object has the energy of motion,
   called ________ kinetic energy ________.

What are some forms of energy?

6. Different forms of energy are chemical energy,
   ________ electrical ________ energy, light energy, mechanical
   energy, thermal energy, and ________ nuclear energy ________.

How can energy change?

7. Energy can be ________ transferred ________ from one object
   to another.

8. When kinetic energy is transferred from one
   marble to another, the second marble picks up
   ________ kinetic energy ________.
9. When energy is _______transformed_____, it changes form.

10. Examples of transformation of energy include the change of electrical energy to _______mechanical______ energy in a blender and the change of electrical energy to light and _______thermal______ energy in a light bulb.

Critical Thinking

11. Put the forms of energy in order according to which form of energy people depended on first. Explain your reasoning.

Possible answer: I think people depended on light energy first. Plants converted light energy into chemical energy that people ate, so chemical energy came next. Matter that is in motion has energy, and thermal energy comes from motion. I think electrical energy from batteries, electricity, and power plants came next, and nuclear power came last.
Work and Energy

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

1. When force is used to move an object, _______________ is done.

2. The ability to do work is _______________.

3. Stored energy is called _______________ energy.

4. Matter in motion has _______________ energy.

5. A(n) _______________ occurs when energy changes from one form to another.

6. Chemical energy is converted to electrical energy in a(n) _______________.

7. Work is done when a force moves a(n) _______________.

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Work and Energy

Fill in the blanks.

<table>
<thead>
<tr>
<th>electrical energy</th>
<th>motion</th>
<th>transferred work</th>
</tr>
</thead>
<tbody>
<tr>
<td>potential energy</td>
<td>stored</td>
<td>transformed work</td>
</tr>
<tr>
<td>kinetic energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>light</td>
<td>thermal</td>
<td></td>
</tr>
</tbody>
</table>

Work is being done when a force moves an object. There is no ________ work ________ being done if an object is not moved. The ability to do work is called ________ energy ________. An object with ________ stored energy is able to do work. This energy is also known as ________ potential energy ________. When an object begins moving, the potential energy changes to ________ kinetic energy ________. Kinetic energy is the energy of ________ motion ________.

When energy is ________ transferred ________, it passes from one object to another. When energy is ________ transformed ________, it changes form. Every day, different forms of energy, such as ________ electrical ________ energy, ________ light ________ energy, ________ thermal ________ energy, and mechanical energy are used. Nuclear energy comes from splitting the tiniest particles of matter.
Hybrid Power

Read the passage in your textbook. As you read, write down the topic sentence of each paragraph.

Topic sentence:

1. Big cities have a lot of cars that run on gasoline.

2. We can become less dependent on gasoline and reduce pollution with better cars.

3. Traditional cars waste gasoline.

4. Hybrid cars use a combination of power.

5. Hybrid cars can make us less dependent on gasoline.

Write About It

Summarize Read the article again. How do hybrid cars work? How do hybrid cars help the environment?

1. How do hybrid cars help people?
   Hybrid cars use less gasoline and produce less air pollution.

2. How do hybrid cars work?
   Hybrid cars have electric motors that are powered by batteries that recharge every time the car comes to a stop.

3. How does that help the environment?
   It helps the environment by producing less pollution.
Reread the article. As you read, record the details that support each of the sentences in the Summarize graphic organizer.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid cars that use gasoline and electrical energy can lessen our dependence on gasoline and reduce air pollution.</td>
<td>The gasoline we use is made from oil, a nonrenewable resource.</td>
</tr>
<tr>
<td>In a traditional car, the gasoline engine runs all the time.</td>
<td>In a traditional car, the gasoline engine runs all the time.</td>
</tr>
<tr>
<td>Hybrid cars use two power sources: gasoline fuel and electrical energy.</td>
<td>Hybrid cars use two power sources: gasoline fuel and electrical energy.</td>
</tr>
<tr>
<td>A hybrid car uses less fuel and switches to a(n) electric motor powered by batteries when the car slows down or comes to a stop.</td>
<td>A hybrid car uses less fuel and switches to a(n) electric motor powered by batteries when the car slows down or comes to a stop.</td>
</tr>
<tr>
<td>The batteries recharge when the car comes to a stop.</td>
<td>The batteries recharge when the car comes to a stop.</td>
</tr>
<tr>
<td>The gasoline engine in a(n) hybrid car is small and energy efficient.</td>
<td>The gasoline engine in a(n) hybrid car is small and energy efficient.</td>
</tr>
</tbody>
</table>
Simple Machines

Use your textbook to help you fill in the blanks.

What are simple machines?

1. A device that uses force to do work is a(n) ________ machine.

2. The force you apply to do work with a lever is called the ________ effort force.

3. A machine that has only a few parts is called a(n) ________ simple machine.

4. A lever makes work easier by reducing the amount of ________ effort force needed to move a load.

5. A lever works in two ways: A small force can be applied over a long ________ distance, or a large force can be applied over a(n) ________ short distance.

What are two other simple machines?

6. A fixed pulley can be used to change the ________ direction of a force; a movable pulley can change the ________ amount of a force needed to move a load.

7. A “wheel and axle” is a simple machine made up of a wheel and a bar ________ fixed to the wheel.
What are inclined planes?

8. An inclined plane is a simple machine with a _______ flat _______ , slanted surface.

9. An inclined plane twisted into a(n) _______ spiral _______ is a screw.

10. With an inclined plane, you need only a _______ small _______ effort force, but you have to move the load _______ farther _______.

How do simple machines work together?

11. A _______ compound machine _______ is made up of a combination of simple machines.

12. How much work a machine produces compared to how much work is applied is the machine’s _______ efficiency _______.

Critical Thinking

13. Which do you think are more useful, simple machines or compound machines? Why?

Possible answer: I think simple machines are more useful, because two or more simple machines can be combined to form a compound machine. A lever is a simple machine, and two levers can be combined to form a compound machine, like a pair of scissors. Most machines are compound machines.
Simple Machines

What am I?

Choose a word from the word box below that answers each question.

<table>
<thead>
<tr>
<th>a. compound machine</th>
<th>e. load</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. effort force</td>
<td>f. pulley</td>
</tr>
<tr>
<td>c. inclined plane</td>
<td>g. simple machine</td>
</tr>
<tr>
<td>d. lever</td>
<td></td>
</tr>
</tbody>
</table>

1. ______ g I am a machine that has only a few parts, and I am used to make work easier. What am I?

2. ______ d I am a machine made up of a bar, the movable part, and a fulcrum, the fixed point. What am I?

3. ______ e I am the object being moved by a machine. What am I?

4. ______ b I am the amount of force needed to do work. What am I?

5. ______ f I am a machine that uses a wheel to change the direction or amount of force needed to move an object. What am I?

6. ______ c I am a machine made up of only one part—a flat, slanted surface. What am I?

7. ______ a I am a combination of two or more simple machines. What am I?
Simple Machines

Fill in the blanks.

<table>
<thead>
<tr>
<th>amount</th>
<th>efficiency</th>
<th>wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td>combination</td>
<td>parts</td>
<td></td>
</tr>
<tr>
<td>compound machines</td>
<td>simple machines</td>
<td></td>
</tr>
</tbody>
</table>

Machines help us by making work easier to do.

Machines change the _______ amount _______ of effort force needed to do work. There are two main types of machines: _______ simple machines _______ and compound machines. Simple machines have only a few _______ parts _______. There are six kinds of simple machines: levers, pulleys, _______ wheels _______ and axles, inclined planes, wedges, and screws.

Most machines are _______ compound machines _______ made from a(n) _______ combination _______ of simple machines. Some compound machines use gears to help the parts of the simple machines work together. The _______ efficiency _______ of a machine is the measure of how much work it does compared to the amount of work it requires.
Forces

Circle the letter of the best answer.

1. A train is traveling west at 80 kilometers per hour. The “80 kilometers per hour” is the train’s
   a. speed.
   b. velocity.
   c. acceleration.
   d. direction.

4. What force between objects is affected by the amount of matter in the objects and the distance between the objects?
   a. inertia
   b. gravity
   c. friction
   d. speed

2. What tendency of objects is described in the following statement?
   A moving object will stay in motion until a force acts on it. An object at rest will stay at rest until a force acts on it.
   a. inertia
   b. acceleration
   c. speed
   d. velocity

5. What type of force can NOT cause a change in motion?
   a. gravity
   b. friction
   c. unbalanced force
   d. balanced force

3. The force that acts on the surfaces along which objects touch is
   a. inertia.
   b. velocity.
   c. gravity.
   d. friction.

6. What type of force can cause a change in an object’s direction, speed, or both?
   a. unbalanced force
   b. balanced force
   c. acceleration
   d. inertia
Circle the letter of the best answer.

7. Force is measured in units called
   a. newtons.
   b. kilometers per hour.
   c. centimeters.
   d. meters.

8. When a force is used to move an object a certain distance, what is being done?
   a. energy
   b. work
   c. inertia
   d. friction

9. Energy is the
   a. result of friction.
   b. motion of an object.
   c. ability to do work.
   d. result of inertia.

10. What is the scientific term for the energy of motion?
    a. inertia
    b. movement
    c. kinetic energy
    d. potential energy

11. The force applied to a simple machine is called the
    a. effort force.
    b. work force.
    c. strong force.
    d. distance force.

12. Any kind of object that is being moved by a simple machine is called a
    a. lever.
    b. load.
    c. fulcrum.
    d. pulley.

13. A simple machine made of a wheel and a cord is
    a. a lever.
    b. a pulley.
    c. a wedge.
    d. a screw.

14. A compound machine is made of
    a. several different parts.
    b. a combination of two or more simple machines.
    c. gears that do work.
    d. electrical parts.
Energy

Fill out the following concept map with information that you have learned from the chapter.

**Heat** is the flow of energy from a(n) ________ object to a(n) ________ object. Heat is transferred by conduction, ________, and ________.

**Sound** is produced when ________ particles create waves. Sound has ________, pitch, amplitude, and ________.

**Electricity** can be static or ________. Static electricity is a build-up of ________ charges in a material. Current electricity is a constant flow of electricity through a(n) ________ circuit.

**Light** travels in ________ waves. Light can ________ ________ off of a surface or ________ ________ when it moves from one material to another.

**Magnetism** is found in magnets and ________ ________. Magnets have a(n) ________ ________ that attracts iron, nickel, and cobalt. Electric current creates electromagnets, which can be turned off with a(n) ________ ________.
Heat

Use your textbook to help you fill in the blanks.

What is heat?

1. Heat is the flow of _______{\text{thermal energy}}____ from one object to another.

2. Heat flows from a(n) _______{\text{warmer}}____ object to a(n) _______{\text{cooler}}____ object.

3. When you toast bread, you also heat the _______{\text{air}}____ around the bread. Touch the toast and _______{\text{thermal energy}}____ moves to your _______{\text{hand}}____.

4. Hot particles _______{\text{slow}}____ as they _______{\text{transfer}}____ thermal energy.

5. When something is heated, its _______{\text{temperature}}____ changes.

6. A tool that is used to measure temperature is a(n) _______{\text{thermometer}}____.

7. Fahrenheit and Celsius are two _______{\text{scales}}____ used to measure _______{\text{temperature}}____.

How does heat travel?

8. Heat is transferred by _______{\text{conduction}}____, _______{\text{convection}}____, and radiation.

9. The transfer of heat through space is called _______{\text{radiation}}____.
10. Matter that transfers heat easily is a(n) conductor.
11. Matter that does not transfer heat easily is a(n) insulator.

How does heat change matter?
12. Particles of matter are always moving.
13. Adding heat makes particles of matter move faster and spread farther apart.
14. Heat can cause matter to burn or change state.

Critical Thinking
15. What materials do you think would make the best potholders? Hint: What do bakers use to take pizza, bread, and cookies out of the oven?

Possible answer: Metal ovens, pans, and cookie sheets conduct heat. All of these are too hot to touch with bare hands. Good potholders are made of things that are not good conductors. Pizza bakers use long wooden spatulas to take the pizzas out of the oven. I think the best potholders are made of thick cotton or wood.
Heat

Match the correct word with its description.

<table>
<thead>
<tr>
<th></th>
<th>a. conduction</th>
<th>b. conductor</th>
<th>c. convection</th>
<th>d. heat</th>
<th>e. insulator</th>
<th>f. melting</th>
<th>g. radiation</th>
<th>h. temperature</th>
</tr>
</thead>
</table>

1. _____ **b**  a material that transfers heat easily
2. _____ **g**  the transfer of heat through space
3. _____ **d**  the flow of thermal energy from one object to another
4. _____ **a**  the transfer of energy that occurs between two objects that are touching
5. _____ **h**  a measure of the average kinetic energy of the particles in a substance
6. _____ **c**  the process of heat transfer in liquids and gases
7. _____ **e**  a material that does not easily conduct heat
8. _____ **f**  a change of state caused by heating
Heat

Fill in the blanks.

<table>
<thead>
<tr>
<th>Celsius</th>
<th>gas</th>
<th>particles</th>
</tr>
</thead>
<tbody>
<tr>
<td>conduction</td>
<td>increases</td>
<td>temperature</td>
</tr>
<tr>
<td>conductors</td>
<td>liquid</td>
<td>thermometer</td>
</tr>
</tbody>
</table>

Heat flows from a warmer object to a cooler object. When heat is added to an object, the object’s _________ temperature ________ rises. A(n) _________ thermometer ________ uses a Fahrenheit or a(n) _________ Celsius ________ scale to show temperature changes in an object.

The thermal energy of particles of matter _________ increases ________ when heat is added and _________ particles ________ move faster. Heat is transferred from one material to another by _________ conduction ________, convection, and radiation. Materials called _________ conductors ________ transfer heat easily. Materials called insulators do not.

Heat can change a solid to a(n) _________ liquid ________ or a liquid to a(n) _________ gas _________. Heat changes matter in many ways!
Sound

Use your textbook to help you fill in the blanks.

What is sound?

1. A vibration is a back-and-forth __________ motion that produces __________ sound.

2. As the bell of an alarm clock vibrates, it causes nearby __________ air particles to move.

3. A wave that transfers sound through matter is a(n) __________ sound wave.

4. Sound waves transfer energy from particle to particle and move away from a vibrating object in __________ all directions.

How does sound travel?

5. Sound waves travel through __________ solids, liquids, and __________ gases.

6. A sound that bounces off a surface is a reflected sound, or a(n) __________ echo.

7. Sound waves travel through different __________ materials at different __________ speeds.

8. Sound travels slowest in a gas. It travels more quickly through a(n) __________ liquid, and travels most quickly through a(n) __________ solid.
9. Dolphins use echoes to navigate and find ________ prey ________.

10. You hear sound when sound waves in the air make tiny ________ organs ________ in your ears vibrate.

How do sounds differ?

11. The distance from the top of one sound wave to the top of the next wave is a(n) ________ wavelength ________.
   The number of wavelengths that pass a point in one second is called ________ frequency ________.

12. The highness or lowness of a sound is its ________ pitch ________.

13. ________ Amplitude ________ affects the volume, or loudness, of sound; it is related to the amount of ________ energy ________ in a sound wave.

What is sonar?

14. We use sound waves in a(n) ________ sonar ________ device to detect objects under water.

15. Sailors use sonar to measure how ________ deep ________ the water is.

Critical Thinking

16. Do you think there is sound in outer space?

   Possible answer: Sound waves are moving particles of matter. If there is no air in outer space, there is no sound. Therefore, I don’t think sound can travel through empty outer space.
Sound

What am I?

Choose a word from the word box below that answers each question.

| a. amplitude | d. pitch | g. volume |
| b. echo | e. sound wave | h. wavelength |
| c. frequency | f. vibration |

1. _____ f I am the back-and-forth motion of an object. What am I?

2. _____ e I am a wave that transfers sound through matter. What am I?

3. _____ b I am a sound that has been reflected off a surface. What am I?

4. _____ h I am the distance from the top of one sound wave to the top of the next sound wave. What am I?

5. _____ c I am the number of wavelengths that pass a point in one second. What am I?

6. _____ d I am the highness or lowness of a sound. What am I?

7. _____ a I am the amount of energy in a sound wave. What am I?

8. _____ g I am the loudness or softness of a sound. What am I?
Sound

Fill in the blanks.

<table>
<thead>
<tr>
<th>bones</th>
<th>directions</th>
<th>particles</th>
<th>vibrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>brain</td>
<td>echo</td>
<td>speeds</td>
<td>waves</td>
</tr>
</tbody>
</table>

Have you ever wondered how you hear sound?

Sound waves travel through your outer ear, where ______ bones ______ send the vibrations to the inner ear. A nerve carries sound messages to the ______ brain ______.

All sounds are produced by ______ vibrations ______ and travel in ______ waves ______. When a bell rings, sound waves move outward as ______ particles ______ of air bump into one another. The waves move away from the bell in all ______ directions ______. A sound wave may bounce off a nearby surface as a reflected sound, or ______ echo ______.

Sound waves travel through various materials at different ______ speeds ______. Sound travels slowest through a gas and fastest through a solid.
The Voice in the Well

Write About It

Personal Narrative  Have you heard an echo? What made the sound? Write a personal narrative about your experience.

Getting Ideas

Use the chart below to plan your personal narrative.

Planning and Organizing

Nikki wrote three sentences. Put the sentences in time order. Write 1 by the event that happened first. Write 2 by the event that happened next. Write 3 by the event that happened last.

2  Then I yelled really loudly.

3  I heard my voice echo through the canyon.

1  I climbed down the steps and walked to the middle of the canyon.

First
I climbed down into the canyon.

Next
I yelled loudly.

Last
My voice echoed off the walls.
Revising and Proofreading
Here are some sentences that Nikki wrote. She forgot to use the first-person pronoun “I” to write about her experience. Rewrite each sentence in the first person.

1. She liked hearing her voice bounce off the canyon walls.
   I liked hearing my voice bounce off the canyon walls.

2. She could hear the echo of her voice.
   I could hear the echo of my voice.

3. She was so scared that she yelled for help, but all she heard was her own echo.
   I was so scared that I yelled for help, but all I heard was my own echo.

Drafting
Begin your personal narrative. Start with an opening sentence using the word “I.” Tell something about yourself. Tell where you are.
Sample sentence: One day, I had the surprise of my life in the middle of a canyon.

Now write your personal narrative. Use a separate piece of paper. Start with the opening sentence you wrote above. Write the events in time order. Use time-order words. Include a beginning, a middle, and an end.

Revising and Proofreading
Now revise and proofread your writing. Ask yourself:
- Did I use the first-person pronoun “I” to tell the story?
- Did I use time-order words?
- Did I correct all mistakes?
Light

Use your textbook to help you fill in the blanks.

What is light?

1. Light is a form of ________ energy ________ we detect with our eyes.

2. A tool used to separate white light into different colors is a(n) ________ prism ________.

3. The colors that make up white light are called the ________ visible spectrum ________.

How does light travel?

4. Light rays ________ bend ________ as they pass from one material to another.

5. Light travels more slowly through ________ denser ________ materials.

6. A lens is a tool used to ________ refract ________, or bend, light.

7. A lens that bends light outward, making objects look smaller, is called a(n) ________ concave ________ lens. A lens that bends light toward its center, making objects look bigger, is called a(n) ________ convex ________ lens.

8. The lens of an eye focuses images on the ________ retina ________. The optic nerve sends images to the ________ brain ________. 
What is reflection?
9. Reflection occurs when light strikes and then
   _______bounces off_______ a surface. Smooth, shiny
   surfaces, such as _______mirrors_______, reflect the
   most light.
10. The law of reflection involves two light rays: the
    _______incoming_______ ray and the outgoing ray. The
    angles of both rays are _______equal_______.

What can light pass through?
11. Opaque material blocks light, _______transparent_______
    material allows light to pass through, and translucent
    material allows some light to pass through but
    _______scatters_______ it in different directions.
12. For privacy, people use _______opaque_______
    materials.

Critical Thinking
13. Why do you think you should avoid wearing black
    clothing on a hot, sunny day?
    Possible answer: Dark colors absorb most of the light that falls on
    them. I think that wearing black clothing would make a person feel
    hotter, because the color would absorb more sunlight.
Light

Match the correct word with its description.

<table>
<thead>
<tr>
<th>a. electromagnetic</th>
<th>d. reflection</th>
<th>g. transparent</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. opaque</td>
<td>e. refraction</td>
<td>h. visible spectrum</td>
</tr>
<tr>
<td>c. prism</td>
<td>f. translucent</td>
<td></td>
</tr>
</tbody>
</table>

1. _____ c a tool used to separate white light into all of its colors
2. _____ a the spectrum that encompasses all of the wavelengths of light
3. _____ e the bending of light rays as they pass through different materials
4. _____ h all of the colors we see that make up white light
5. _____ b a material through which light cannot pass
6. _____ g a material through which light can pass
7. _____ f a material through which light can pass but will be scattered in different directions
8. _____ d the property of light in which light rays strike a mirror and bounce off
Light

Fill in the blanks.

<table>
<thead>
<tr>
<th>blocked</th>
<th>reflection</th>
<th>transparent</th>
</tr>
</thead>
<tbody>
<tr>
<td>concave</td>
<td>refraction</td>
<td>two</td>
</tr>
<tr>
<td>mirrors</td>
<td>translucent</td>
<td></td>
</tr>
</tbody>
</table>

Light has certain properties. It passes through some materials and is blocked by others. Opaque materials block light, translucent materials let some light pass through, and transparent materials allow all light to pass through.

The process in which light waves bend as they pass from one transparent material to another is called refraction. Lenses refract light in different ways. Two kinds of lenses are concave and convex lenses.

Light can also bounce off an object. This is called reflection. Smooth, shiny surfaces, such as mirrors, reflect the most light. Reflection involves two light rays: an incoming ray and an outgoing ray. The angles of both rays are equal.
Electricity

Use your textbook to help you fill in the blanks.

What is electrical charge?

1. All matter is made up of tiny particles called __________ atoms.

2. Atoms contain particles with both ________ positive ________
   and ________ negative ________ electrical charges.

3. We can show a positive charge as a(n) ________ plus sign (+) ________
   and a negative charge as a(n) ________ minus sign (−) ________.

4. Opposite charges ________ attract ________ each other,
   and like charges ________ repel ________ each other.

5. The ________ buildup ________ of electrical charges on a
   material is called ________ static ________ electricity.

How do charges move?

6. Lightning is a(n) ________ discharge ________ of static
   electricity during a ________ storm ________.

7. The path along which electric current flows is called
   a(n) ________ circuit ________.
8. A continuous flow of electricity through a circuit is called _______ electricity. An unbroken circuit is called a(n) _______ circuit. 

9. A circuit with a gap is a(n) _______ circuit; a circuit can be opened and closed with a(n) _______.

What are series and parallel circuits?

10. Electric current flows along a single path in a _______ circuit.

11. A parallel circuit connects each load to the power source by different paths called _______.

How can you use electricity safely?

12. A fuse box and a circuit breaker are two safety devices that _______ a circuit when the current of electricity is dangerously _______.

Critical Thinking

13. Why do you think there’s only one shock after you rub your socks (while your feet are in them) on the carpet and then touch the doorknob, but when you rub a balloon on the curtains or carpet and place it on the wall, it stays there for a long period of time?

Possible answer: In both cases, there is a buildup of charges of static electricity. I think that people and doorknobs are good conductors of electricity, but balloons, curtains, and walls are not.
Electricity

What am I?

Choose a word from the word box below that answers each question.

<table>
<thead>
<tr>
<th>a. circuit</th>
<th>d. parallel circuit</th>
<th>g. switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. current electricity</td>
<td>e. series circuit</td>
<td></td>
</tr>
<tr>
<td>c. discharge</td>
<td>f. static electricity</td>
<td></td>
</tr>
</tbody>
</table>

1. _____ f I am a buildup of negative charges on an object. What am I?
2. _____ c I am the fast movement of charge from one object to another. What am I?
3. _____ a I am made up of parts that work together to form a complete path, allowing electricity to flow. What am I?
4. _____ b I am the result of the continuous flow of electricity through a circuit. What am I?
5. _____ g I control the flow of electric current through a circuit. What am I?
6. _____ e I am a circuit in which one loop of wire connects all of my parts. I will not work if one of my parts is removed. What am I?
7. _____ d I am a circuit in which each part is connected to the power source through a separate path. I will continue to work if one of my parts is removed. What am I?
Electricity

Fill in the blanks.

<table>
<thead>
<tr>
<th>atom</th>
<th>moves</th>
<th>series circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>circuit</td>
<td>parallel circuit</td>
<td>short circuit</td>
</tr>
<tr>
<td>equal</td>
<td>rubbed</td>
<td>static electricity</td>
</tr>
</tbody>
</table>

Matter is made up of negatively and positively charged particles. An **atom** usually has an **equal** number of opposite charges. When two materials, such as a balloon and cloth, are **rubbed** together, a buildup of **static electricity** forms. Discharge occurs when a charge **moves** quickly from one object to another.

Current electricity flows through a path called a(n) **circuit**. An **series circuit** contains parts connected with one loop of wire. An **parallel circuit** contains objects connected to a power source with separate paths. Frayed wires in a(n) **short circuit** can cause a fire. Fuses and circuit breakers prevent the excessive flow of current.
Magnetism and Electricity

Use your textbook to help you fill in the blanks.

What is a magnet?

1. A magnet is an object or a material that can attract metals containing iron, nickel, or cobalt.

2. Magnets can attract and repel each other.

3. All magnets have a north pole and a(n) south pole.

4. The north poles and south poles of two magnets will repel each other.

5. The attraction of magnets is strongest when magnets are close together.

What are magnetic fields?

6. A magnetic field is the area of magnetic force around a magnet.

What is an electromagnet?

7. An electromagnet is a coil of wire wrapped around a metal core; current moving through the wire can be turned off with a(n) switch.

8. Electromagnets are often used to power electric motors.
What is a generator?

9. Almost all electricity is produced by __________ generators ________.

10. Generators produce back-and-forth current called __________ alternating ________ current. Batteries produce current in one direction, called __________ direct ________ current.

11. Air, steam, and __________ water ________ turn turbines.

How does electricity get to your home?

12. Electricity from a power plant is carried to a series of __________ transformers ________.

13. Each transformer in the series increases or decreases the current's __________ voltage ________ until it is at the right level to enter your home.

Critical Thinking

14. Do you think there is a difference between the simple motor used in the electric cars your parents may drive and the model cars you and your friends may race?

Possible answer: All electric motors have a power source, a magnet, a rotating loop of wire, and a motor shaft. I think the only difference is the type or size of the power source. If model cars are remote-controlled, then electromagnets can also be used to power the electric motors.
Magnetism and Electricity

Match the correct word with the description.

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<tbody>
<tr>
<td>a.</td>
<td>attract</td>
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<td>b.</td>
<td>electromagnet</td>
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<td>c.</td>
<td>electric motor</td>
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<td>d.</td>
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<td>e.</td>
<td>magnetic field</td>
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1. _____ a. how the north pole of one magnet and the south pole of another magnet react to each other
2. _____ h. how the north poles or south poles of two magnets react to each other
3. _____ g. where the force of a magnet is strongest
4. _____ e. the area of magnetic force around a magnet
5. _____ b. a magnet created by an electric current
6. _____ f. a device that changes electrical energy into mechanical energy
7. _____ d. a device that changes mechanical energy into electrical energy
8. _____ c. made of a power source, a magnet, a rotating loop of wire, and a motor shaft
Magnetism and Electricity

Fill in the blanks.

- distance
- electromagnet
- magnetic field
- motors
- electrical
- generators
- mechanical
- transformers

Magnets attract or repel each other. The distance between two magnets determines the strength of their magnetic force. The magnetic force around a magnet is its magnetic field.

Electric current creates a(n) electromagnet that can be turned off with a switch. Electromagnets power motors that change electrical energy into mechanical energy.

The electricity we use is produced at power plants by generators that change mechanical energy into electrical energy. The voltage of electricity is adjusted in transformers. Then it is sent to our homes.
Motors at Work

Refrigerators, vacuum cleaners, hair dryers, and fans have one thing in common: they all have a motor. You can use those motors today because of people such as Joseph Henry and Michael Faraday. In 1831, these two scientists discovered how to use electromagnets to turn electrical energy into motion.

A few years later, Thomas Davenport, a blacksmith in Vermont, learned about electromagnets and built the first simple motor. He used the device to separate iron from iron ore.

It wasn’t long before people started inventing new devices that used motors. Washing machines, invented in the early 1900s, use a motor to turn and wash your clothes. Another motor in a washing machine turns the water faucet on and off. Some of the first automobiles ran on electrical energy. Today many new cars use electric motors in addition to gasoline engines. Motors are useful for a lot of things! Can you think of any other machines that use electric motors?

Write About It

Problem and Solution What problem did Thomas Davenport solve with his motor? Write about a problem you have had, such as a messy room. How did an electric motor help you solve the problem?
Possible answer: Thomas Davenport first used the motor he built to separate iron from iron ore. One time, I burnt popcorn in the microwave. An electric motor helped me get rid of the smell by powering a fan.

**Problem and Solution**

Use the Problem and Solution graphic organizer below to record the problem you need to solve and your plan for solving it.

- **Problem**
  
  Possible problem: I am getting hungry, but I have to help clean the house before lunch.

- **Steps to Solution**
  1. I need to clean the carpet in my room, in the hallway, and in the living room.
  2. I need to clean my dirty clothes.

- **Solution**
  
  I will use the vacuum cleaner and washing machine to complete my chores. Then I can make a sandwich and eat lunch.
Energy

Circle the letter of the best answer.

1. A form of energy that always moves from a warmer object to a cooler object is
   a. electricity.
   b. sound.
   c. light.
   d. thermal.

2. Which process transfers heat through liquids or gases?
   a. conduction
   b. convection
   c. radiation
   d. acceleration

3. Which of these has magnetic properties and can be controlled by a switch?
   a. an electric current
   b. an electromagnet
   c. a magnetic field
   d. a magnetic force

4. What is produced when energy causes particles to vibrate in waves?
   a. light
   b. sound
   c. electricity
   d. heat

5. Which of these terms describes the highness or lowness of a sound?
   a. wavelength
   b. pitch
   c. echo
   d. frequency

6. A device that indicates the direction of Earth’s North Pole is a
   a. generator.
   b. motor.
   c. compass.
   d. sonar.
Circle the letter of the best answer.

7. The entire range of waves that make up light is the
   a. white light.
   b. electromagnetic spectrum.
   c. visible spectrum.
   d. law of reflection.

8. Which term describes how light bends as it passes from one transparent material into another?
   a. reflection
   b. refraction
   c. vibration
   d. convection

9. What type of material allows some light to pass through?
   a. convex
   b. transparent
   c. translucent
   d. concave

10. Which of these is produced by the buildup of negative charges on a material?
    a. conduction
    b. magnetism
    c. static electricity
    d. current electricity

11. Which of these is made up of parts that work together to allow electricity to flow?
    a. circuit
    b. insulator
    c. current
    d. electromagnet

12. The movement of static electricity is called a
    a. circuit.
    b. discharge.
    c. wavelength.
    d. frequency.

13. The region of magnetic force around a magnet is called a
    a. magnetic field.
    b. visible spectrum.
    c. compass.
    d. generator.