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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From Cells to Ecosystems

Complete the concept map by filling in answers where blanks appear.

**All Living Things**

- are made of
  - 
- are part of a(n)
  - 

There are two types of cells.

Each type of cell has certain unique parts.

- large vacuole
  - 

There are three types of organisms in ecosystems.

- producers
  - 
- decomposers
  - 
- plants and algae
  - 

Name __________________________ Date ____________
Cells

Use your textbook to help you fill in the blanks.

What are cells?

1. All organisms, or living things, are made of ____________ .

2. Every cell in every living thing comes from another cell that ____________ .

3. A single-celled organism that can carry on all its life processes is called ____________ .

4. Organisms made up of more than one cell are called ____________ .

5. Scientists have identified more than ____________ different kinds of organisms.

6. Scientists estimate there may be more than ____________ kinds of unicellular organisms.

What is inside an animal cell?

7. Both plant and animal cells perform life processes by using ____________ .

8. All cells are surrounded by a(n) ____________ that controls the materials that move in and out of the cell.

9. The region between the cell membrane and the nucleus is filled with ____________ .

10. The cell’s control center is called the ____________ .
11. The tiny power plants in the cell where food is burned and energy is released are called ________________.

12. A structure in a cell used for storage of water, food, and waste is the ________________.

What is inside a plant cell?

13. Plant cells have a(n) ________________; a rigid structure that serves as an outer covering.

14. A green structure, called a(n) ________________, uses the energy from the sun to produce food for the plant.

How are cells organized?

15. Cells working together at the same job form a(n) ________________.

16. Groups of tissues working together form organs, and groups of organs working together form ________________.

Critical Thinking

17. Compare and contrast the cells of plants, animals, and unicellular organisms.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Cells

Read each clue and fill in the crossword puzzle.

Across
3. the smallest unit of a living thing that can carry out the basic processes of life
5. sunlight-absorbing chemical
7. a living thing

Down
1. organisms that contain many different types of cells
2. a gel-like liquid inside the cell
4. organisms having one cell
6. a cell’s control center

Vocabulary

Cell  cytoplasm  nucleus  organism  chlorophyll  multicellular
Cells

Fill in the blanks.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>cytoplasm</th>
<th>nucleus</th>
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<tbody>
<tr>
<td>cell wall</td>
<td>mitochondria</td>
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<td>cells</td>
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</table>

All living things are made up of units called _____________. Some organisms are ______________; that is, they consist of only one cell. More complex organisms, including plants and animals, are called ______________ organisms.

All cells are surrounded by a(n) ______________ that controls what moves into and out of the cell. The insides of cells are filled with a gel-like fluid called ______________. Within this liquid are the cell ______________. Both plant and animal cells, as well as many unicellular organisms, contain a(n) ______________ and ______________, which supply energy for the cell. Plant cells have a(n) ______________, one large central vacuole, and chloroplasts. Chloroplasts contain chlorophyll which uses energy from sunlight to produce food for the plant.
Relationships in Ecosystems

Use your textbook to help you fill in the blanks.

What is in an ecosystem?

1. The living things in an environment are ______________ factors.

2. The nonliving things in an environment are ______________ factors.

3. All the living and nonliving things interacting in an environment make up a(n) ______________ .

4. All the members of a species within an ecosystem are a(n) ______________ .

5. Together, the populations in an ecosystem form a(n) ______________ .

How are food chains alike?

6. The path that energy takes in an ecosystem as it flows from organism to organism is a(n) ______________ .

7. At the base of each food chain are ______________ that use the Sun's energy to make sugar and oxygen .

8. Sugar molecules are the original source of food for ______________ , or any animal that eats plants or other animals.
9. Organisms in an ecosystem that break down dead or decaying plants and animals are ____________________.

What are food webs made of?
10. A network of food chains that share some links is a(n) ____________________.

11. Organisms that are eaten by other animals are ____________________.

What are symbiotic relationships?
12. A symbiotic relationship that benefits both organisms is called ____________________.

13. In ____________________ one organism benefits and the other is not harmed.

What are parasites?
14. An organism that lives on or in another organism and harms it is a(n) ____________________.

Critical Thinking
15. What would happen if producers were removed from an ecosystem?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Relationships in Ecosystems

Who am I? What am I?

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

1. ______ I am a symbiotic relationship that benefits one organism without harming the other. What am I?
2. ______ I am an organism that lives off of and harms its host. What am I?
3. ______ I am a network of food chains that are connected. What am I?
4. ______ I am an animal that hunts other animals for food. Who am I?
5. ______ I include all living and nonliving things in an environment. What am I?
6. ______ Predators hunt me for food. Who am I?
7. ______ All the members of a single species in an ecosystem are part of me. What am I?
8. ______ I am the path that energy takes as it moves from one organism to another in an ecosystem. What am I?

a. commensalism
b. ecosystem
c. food chain
d. food web
e. parasite
f. population
g. predator
h. prey
Relationships in Ecosystems

Fill in the blanks.

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<thead>
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<th>carnivores</th>
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<th>herbivores</th>
<th>population</th>
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<tbody>
<tr>
<td>community</td>
<td>food web</td>
<td>plants</td>
<td>symbiosis</td>
</tr>
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</table>

All the living and nonliving things in an environment make up an ecosystem. Within an ecosystem, all living things make up a(n) ________________ . All individuals of one species are a(n) ________________ . An ecosystem can be as large as a forest or as small as a fallen log.

The path that energy takes as it moves from one organism to another in an ecosystem is a(n) ________________ . A group of connected food chains is a(n) ________________ . Producers, such as ________________ and algae, are at the base of each food chain. Consumers include ________________ that eat plants and ________________ that eat other animals.

A close relationship between two or more kinds of organisms that lasts over time is called ________________ .
Photosynthesis

Use your textbook to help you fill in the blanks.

What is photosynthesis?

1. Plants get energy to make food from ___________________________.

2. ___________________________ is the process of making food using sunlight.

3. Photosynthesis occurs in cells that have ___________________________.

4. Sunlight, ___________________________ and ___________________________ are needed to perform photosynthesis.

5. Chloroplasts act like tiny factories that make food in the form of ___________________________.

What do leaves do?

6. Tiny pores, called stomata, on the bottom of leaves take in ___________________________ from the air.

7. The opening and closing of stomata is controlled by ___________________________.

8. When a plant has enough water, the ___________________________ swell and pull open the stomata so the plant can breathe.

9. In most plants, photosynthesis occurs in the chloroplast of the cells that are under the ___________________________.

10. When plants store sugar, they store it as a molecule made up of long chain of sugars called ___________________________.

11. Scientists express what happens during photosynthesis using this chemical equation: ___________________________.

Use with Lesson 3 Photosynthesis
What is the photosynthesis and respiration cycle?

12. The sugar that plants produce during photosynthesis is a _carbohydrate_, a compound made from carbon, hydrogen, and oxygen.

13. Cellulose, the main substance that makes up the _cell walls_ in plants, is a carbohydrate.

14. When you eat a vegetable, your body _metabolizes_ from the carbohydrates stored in the plants.

15. _Cellular respiration_ is the processes in which plant and animal cells use oxygen to break down stored carbohydrates.

16. Plant and animal cells produce _ATP_ and _NADH_ during cellular respiration.

What are energy pyramids?

17. A diagram that shows the energy that is available at each level of an ecosystem is a(n) _energy pyramid_.

18. At each level of an energy pyramid, about _90%_ percent of the energy from the level below is lost.

Summarize the Main Idea

19. How do plants make and use energy?

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
Photosynthesis

Fill in the blanks.

1. _____ the process that uses energy from the Sun to make food from water and carbon dioxide

2. _____ a diagram that shows the amount of energy available at each level of an ecosystem

3. _____ tiny pores in the bottom of leaves take in carbon dioxide from the air

4. _____ a compound made from carbon, hydrogen, and oxygen

5. _____ Starches and sugars are broken down in the cells in this process.

Vocabulary

- a. carbohydrate
- b. cellular respiration
- c. energy pyramid
- d. photosynthesis
- e. stomata
Photosynthesis

<table>
<thead>
<tr>
<th>carbohydrate</th>
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<th>starch</th>
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<tr>
<td>cellular respiration</td>
<td>energy</td>
<td>stomata</td>
</tr>
<tr>
<td>chlorophyll</td>
<td>photosynthesis</td>
<td>water</td>
</tr>
</tbody>
</table>

Fill in the blanks.

How does the Sun give you the energy you need to do your schoolwork? When a plant gets enough water, the guard cells in the leaf swell and pull open the ________________ . The Sun shines on the plant so its leaves can make food from ________________ and carbon dioxide. This process is called ________________, which means “putting together by light.” Photosynthesis takes place in the ________________ of the cells underneath the epidermis, or skin of the leaf. Chloroplasts contain ________________, a green chemical that absorbs and stores the energy of sunlight. Sugar is a ________________ made from carbon, hydrogen, and oxygen. Plants store sugar as a ________________ .

When the plant needs energy to grow or repair itself, it breaks down starches and sugars in a process called ________________. When you eat a vegetable, or when you eat meat from an animal that eats plants, your body gets ________________ from the sugars and carbohydrates stored in the plant.
Saving Water the Yucca Plant Way

Read the Writing in Science feature in your textbook.

Write About It

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

Planning and Organizing

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

I. What happens during the day in CAM photosynthesis?
II. What is the purpose of CAM photosynthesis?
III. What is photosynthesis?
IV. What happens at night during CAM photosynthesis?
V. How does the process of CAM photosynthesis work?

I. 

II. 

III. 

A. 

B. 

IV. Why is the yucca plant special?

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

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

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

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

Now revise and proofread your article. Ask yourself:

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

Use your textbook to help you fill in the blanks.

How can ecosystems change?

1. Ecosystems are changed by living __________________________ that change the environment around them, and by __________________________ events such as floods.

2. Humans can change ecosystems by __________________________ new species or __________________________ existing species.

How do people affect the environment?

3. Pollution is a(n) __________________________ change in the natural environment.

4. Air pollution from burning fuels causes __________________________.

How does waste affect the land?

5. Some household garbage breaks down, but some garbage is not __________________________.

6. __________________________ contains poisonous chemicals and metals.

What happens when ecosystems change?

7. When a type of organism cannot respond to changes in an ecosystem, it may become __________________________.

8. When a species is in danger of extinction, it is called an __________________________ species.

9. Species that could become endangered are known as __________________________ species.
How do ecosystems come back?

10. Over time, a group of species in an ecosystem is replaced by a different group of species through ________________.

11. In regions where few species existed before or where species were wiped out, ________________ occurs.

12. The first species to take hold in barren areas are ________________ species, such as mosses and lichens.

13. As larger plants and predators begin to live in an area, the community may become a(n) ________________, such as a prairie.

14. With enough moisture, ________________ may start to grow in a grassland.

15. A fully developed ecosystem supports the final stage of succession, a(n) ________________ community.

What is secondary succession?

16. When a new community develops where a community had once existed, it is called ________________ succession.

Critical Thinking

17. What are some of the ways that people cause harm to the land?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Changes in Ecosystems

Match the correct letter with the description.

1. When Earth’s land, water, and air have reached their capacity to absorb and recycle wastes naturally, ______ occurs.
2. When a species dies out completely, the species is ______ .
3. The establishment of a new community where a community had already existed is called ______ .
4. Species with low numbers that could become endangered are called ______ .
5. A species that is in danger of becoming extinct is a(n) ______ .
6. In the final stages of succession, a(n) ______ develops.
7. One of the first species to live in an area that used to be lifeless is a(n) ______ .
8. Succession that occurs where there is no soil and where few, if any, living things exist is ______ .
Changes in Ecosystems

Fill in the blanks.

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<th>animal</th>
<th>plants</th>
<th>species</th>
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<td>trees</td>
</tr>
<tr>
<td>pioneer</td>
<td>secondary succession</td>
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Ecosystems change over time. People cause some of the changes, through pollution, ____________ destruction, or hunting, or by introducing or removing ____________.

However, many ecosystem changes are natural. When land is burned by a fire or a farm field is abandoned, ____________ occurs. New ____________ begin to grow in the soil. Weeds, then shrubs, and finally ____________ grow. When few, if any, living things exist in an area, ____________ will establish a first community. The first organisms to live in the area are called ____________ species. After soil is established, larger plants can grow, and larger ____________ species can arrive. Eventually, forests develop. Finally, in the last stage of succession, a climax community is established.
From Cells to Ecosystems

Choose the letter of the best answer.

1. All living and nonliving things in an environment make a(n)
   a. population.  b. ecosystem.  c. food web.  d. food chain.

2. The part of a cell that controls all of its activity is the
   a. cell wall.  b. cytoplasm.  c. nucleus.  d. vacuole.

3. Structures in plant cells that turn energy from sunlight into food are called
   a. chloroplasts.  b. cell walls.  c. cytoplasm.  d. mitochondria.

4. An individual living thing is a(n)
   a. nucleus.  b. parasite.  c. organism.  d. organ.

5. The first organisms to occupy an environment are called the
   a. extinct species.  b. threatened species.  c. endangered species.  d. pioneer species.

6. The smallest unit of a living thing that carries out basic life processes is a(n)
   a. cell.  b. cell membrane.  c. cell wall.  d. chloroplast.

7. In living things, tissues of different kinds come together to make up a(n)
   a. organ.  b. organism.  c. organ system.  d. tissue.

8. The outside layer that controls what moves in and out of the cell is its
   a. cell membrane.  b. tissue.  c. cytoplasm.  d. nucleus.
Choose the letter of the best answer.

9. In mitochondria, food is broken down and turned into energy through the process of
   a. photosynthesis.  
   b. cellular respiration.  
   c. pollution.  
   d. recycling.

10. Structures in cells that store water, food, and wastes are called
    a. chloroplasts.  
    b. cytoplasm.  
    c. mitochondria.  
    d. vacuoles.

11. Organisms that are made of many different kinds of cells are called
    a. invertebrate.  
    b. multicellular.  
    c. unicellular.  
    d. vertebrate.

12. The sugar that plants produce during photosynthesis is a
    a. carbohydrate.  
    b. pollutant.  
    c. parasite.  
    d. chloroplast.

13. The gel-like substance in a cell that supports all of the cell structures is the
    a. cell wall.  
    b. chloroplast.  
    c. cytoplasm.  
    d. mitochondria.

14. A one-celled organism is
    a. monocellular.  
    b. multicellular.  
    c. single cellular.  
    d. unicellular.

15. Plants release water and oxygen through their
    a. cellulose.  
    b. carbohydrate.  
    c. stomata.  
    d. starch.

16. A collection of poisonous materials that must be carefully disposed of is called
    a. acid rain.  
    b. toxic waste.  
    c. incineration.  
    d. fossil fuel.

17. When pollution mixes with moisture in the atmosphere it forms
    a. acid rain.  
    b. tissue.  
    c. population.  
    d. stomata.
Heredity and Diversity

Complete the concept map with information you have learned about different types of reproduction. Some answers have been written for you.

### All Living Things Reproduce

<table>
<thead>
<tr>
<th>Types of Reproduction</th>
<th>Organisms That Use This Type of Reproduction</th>
<th>Does this type of reproduction enhance genetic variation?</th>
<th>Disadvantages or Advantage to This Type of Reproduction</th>
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<td>bacteria</td>
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</table>
Reproduction

Use your textbook to help you fill in the blanks.

What are sexual and asexual reproduction?

1. Survival of a(n) ________________ depends on its ability to produce offspring.

2. Every organism comes from a parent through the process of ________________.

3. The transfer of ________________ from parents to their offspring is known as reproduction.

4. Genetic material contains the information that controls an organism’s ________________.

5. The production of a new organism from two parents is called ________________ reproduction.

6. When an egg cell joins with a sperm cell, ________________ occurs.

7. A fertilized egg develops into an individual with traits from each ________________.

8. The production of a new organism from a single parent is called ________________ reproduction.

How do organisms reproduce asexually?

9. Most bacteria and unicellular protists reproduce by making a copy of their genetic material and ________________. 

10. Cnidarians, sponges, and some fungi can reproduce through ________________.

11. The eggs of insects, fish, frogs, and lizards sometimes develop into new animals without being ________________.

12. New plants can grow from leaves, roots, or stems. This type of asexual reproduction is called ________________.

13. Strawberry plants and ferns can reproduce asexually by forming ________________.

**How do sexual and asexual reproduction compare?**

14. An organism that reproduces asexually does not have to find a(n) ________________.

15. Organisms that reproduce asexually tend to be well-suited to their ________________.

**Critical Thinking**

16. Why is sexual reproduction better than asexual reproduction for ensuring the survival of a species in a changing environment?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Reproduction

Read each clue. Write the answer in the blanks using the words below. Then fill in the crossword puzzle.

<table>
<thead>
<tr>
<th>asexual</th>
<th>runners</th>
<th>splitting</th>
<th>variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>budding</td>
<td>sexual</td>
<td>trait</td>
<td>vegetative</td>
</tr>
</tbody>
</table>

Across

3. plant stems that run along the ground and sprout as new plants
5. any characteristic of a living thing
6. type of reproduction in which a new organism is produced from one parent
7. manner in which bacteria reproduce

8. Sexual reproduction gives rise to this in a species.

Down

1. a bud growing from a fungus to become a new individual.
2. type of propagation in which a new plant grows from a leaf
4. type of reproduction in which a new organism is produced by two parents
Reproduction

Fill in the blanks.

<table>
<thead>
<tr>
<th>asexual</th>
<th>mate</th>
<th>sexual</th>
<th>variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>splitting</td>
<td>reproduce</td>
<td>sperm</td>
<td></td>
</tr>
</tbody>
</table>

No organism lives forever. This means all organisms must _____________. There are two types of reproduction: _____________ and _____________. Sexual reproduction requires two parents. A female egg cell unites with a male ____________ cell to produce a fertilized egg. The fertilized egg grows into a new, unique individual.

Asexual reproduction requires only one parent and results in offspring that are genetically identical to the parent.

The main advantage of sexual reproduction is that it promotes ____________ within a species. An advantage of asexual reproduction is that it does not require finding a(n) _____________. There are several methods of asexual reproduction. Simple, one-celled organisms, like bacteria and protists, undergo _____________. Animals such as cnidarians, sponges, and fungi undergo a process called budding.
How Do Sea Stars Regenerate?

Write About It

Explanatory Writing Explain how sea stars produce offspring using regeneration. Choose another animal that reproduces asexually. Write an explanation of how this process takes place.

Getting Ideas

Choose an animal to write about. Think about how it reproduces without parents. Write the steps below.

Planning and Organizing

Xavier wants to explain how flatworms reproduce. Here are three sentences he wrote. Put them in order.

1. Finally, each half grows into a separate flat worm.
2. First, the flatworm divides in two.
3. Stem cells turn into the types of cells needed to reproduce the missing part.
Drafting
Write a sentence to begin your explanation. Name the animal you are writing about. Tell your main idea about how this animal reproduces. This is your topic sentence.

__________________________________________________________________

Now write your explanation. Use a separate piece of paper. Begin with your topic sentence. Explain how the animal reproduces. Write the steps in time order.

Revising and Proofreading
Here are some sentences Xavier wrote. Combine each pair. Use the time order word in parentheses. Write the new sentence on the line.

1. The stem cells multiply. They turn into specialized cells. (before)
   ____________________________________________________________________

2. A message is sent out to specialized cells. The cells near the wound cover it. (after)
   ____________________________________________________________________

Now revise and proofread your writing. Ask yourself:
► Did I explain how the animal can reproduce without parents?
► Did I include time order words?
► Did I correct all mistakes?
Traits and Heredity

Use your textbook to help you fill in the blanks.

What is heredity?

1. The passing of traits from one generation to the next is called _________________.

2. Traits that offspring receive from their parents are ________________ traits.

3. A way of acting or behaving with which an animal is born is called a(n) _________________.

4. A behavior that develops during an animal’s lifetime is a(n) ________________ behavior.

5. When ducks hatch, they learn to recognize and follow their mother, a behavior called _________________.

How are traits inherited?

6. Mendel discovered that each inherited trait is controlled by ________________, one from each parent.

7. Today scientists refer to Mendel’s factors as _________________.

8. Genes are found in the nucleus of the cell. They are stored on _________________.

9. A trait that masks another trait is called a(n) ________________ trait.

10. A trait that is masked is called a(n) ________________ trait.
11. In pea plants, purple flowers are a dominant trait and white flowers are a recessive trait. The purple trait is represented by _________________ and the white trait by p.

**How do we trace inherited traits?**

12. A chart used to trace the history of traits in a family is called a(n) _________________.

13. On a pedigree chart, horizontal lines connect parents and vertical lines connect parents to _________________.

14. Males are represented by squares, and _________________ are represented by circles.

15. Shaded shapes represent individuals with a particular _________________, and unshaded shapes represent individuals without that trait.

16. Dimples are a dominant trait, represented by the letter D. A child who is a carrier of the recessive trait is represented by _________________.

**Critical Thinking**

17. Both a father and mother have dimples. Their son has dimples, but their daughter does not. Which genes, DD, Dd, or dd, does each family member have?

_________________________________________________

_________________________________________________

_________________________________________________

_________________________________________________
# Traits and Heredity

Match the correct letter with the description.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>carrier</td>
<td>d.</td>
<td>heredity</td>
</tr>
<tr>
<td>b.</td>
<td>dominant</td>
<td>e.</td>
<td>inherited</td>
</tr>
<tr>
<td>c.</td>
<td>gene</td>
<td>f.</td>
<td>instinct</td>
</tr>
<tr>
<td>g.</td>
<td>pedigree</td>
<td>h.</td>
<td>recessive</td>
</tr>
</tbody>
</table>

1. ______ a trait that an offspring receives from its parents
2. ______ the passing down of traits from one generation to the next
3. ______ behavior that is inherited
4. ______ a trait that masks another trait
5. ______ a trait that is masked or covered by another trait
6. ______ chart used to trace the history of traits in a family
7. ______ contains the chemical instructions for an inherited trait
8. ______ individual who has inherited a gene for a trait, but does not show the trait physically
Traits and Heredity

Fill in the blanks.

Parents pass on features of themselves to their offspring. Any notable feature of an organism is called a(n) _____________. The passing down of traits from parents to offspring is called _______________. Some traits, such as hair or eye color, are physical traits. Other inherited traits are behavioral and are called _______________. An Austrian monk, _______________, discovered how traits are inherited.

Today, Mendel’s factors are called _______________. They are stored on the _______________ inside the nucleus of cells. Offspring receive one set of genes from an egg cell and the other from the _______________ that fertilized the egg cell.

Humans have an estimated 20,000 gene pairs. Some of these traits are easy to see. The history of a family trait and the way it has been inherited can be charted in a _______________. These charts can be used to study heredity patterns.
Genetically Modified Corn

Read the Reading in Science feature from your textbook. Look for cause and effect relationships.

**Cause and Effect**

Fill in the Cause and Effect Chart with cause and effect relationships you find in the article.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn borer eats corn.</td>
<td></td>
</tr>
<tr>
<td>Bt powder sprayed on corn.</td>
<td></td>
</tr>
<tr>
<td>Other living things eat Bt corn.</td>
<td>Corn plants make Bt toxin in their own cells, so the corn plants can protect themselves.</td>
</tr>
</tbody>
</table>
Write About It

Cause and Effect
1. Explain how the bacterium Bt affects corn borers.
2. Tell how genetically modified corn might cause problems for other insects and the environment.

Planning and Organizing

Answer these questions in detail.

3. What does the Bt bacterium produce, and what effect does it have on corn borers?

4. What enables the Bt bacterium to make a protein that is toxic to corn borers?

5. What was transferred from the Bt bacterium to Bt corn?

6. How does Bt corn affect corn borers?

7. How might Bt corn affect other living things, such as Monarch butterflies?
Animal Adaptations for Survival

Use your textbook to help you fill in the blanks.

What is adaptation?

1. A characteristic that helps an organism survive in its natural environment is a(n) _____________.

2. Organisms that are best adapted to their environment _______________ and pass on their traits to offspring.

3. A trait that helps an organism survive in its environment, such as the _______________ of an animal’s fur, is a(n) _______________ adaptation.

What are behavioral adaptations?

4. A characteristic that is an organism’s response to its environment is a(n) _______________ adaptation.

5. A(n) _______________ is an inherited behavior.

6. Some birds and mammals perform elaborate attention-getting dances to attract a(n) _______________.

7. Some adaptive behaviors can also help organisms take care of their _______________.

Use with Lesson 3

Chapter 2 • Heredity and Diversity

Reading and Writing
What are adaptations to climate?

8. To keep warm in cold climates, animals have _________________ fur.

9. In hot deserts, animals are often more active at _________________, when temperatures drop.

What adaptations do predators and prey have?

10. Any color, shape, or pattern that lets an organism blend into its environment is _________________.

11. A type of camouflage in which an organism’s coloring helps it blend in with its background is _________________ coloring.

12. When an organism matches the color, shape, and texture of the environment around it, it is showing protective _________________.

What is mimicry?

13. An adaptation in which an organism gets protection from predators by looking like a dangerous animal is _________________.

14. Predators also use this characteristic to fool _________________; believing that the predators are harmless, prey come close enough to be caught.

Critical Thinking

15. How do adaptations help an organism survive in its environment?
Animal Adaptations for Survival

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

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

1. An organism that matches the color, shape, and texture of its environment is using protective ________________.

2. A type of coloring, shape, or pattern that allows an organism to blend in with its environment is ________________.

3. Any characteristic that helps an organism survive in a certain environment is a(n) ________________.

4. An adaptation in which an animal is protected against predators by its resemblance to an unpleasant or dangerous animal is ________________.

5. A type of camouflage in which the color of an animal blends in with the animal’s background is protective ________________.
Animal Adaptations for Survival

Fill in the blanks.

| camouflage | mimicry | scarce |
| chemicals  | penguin | streamlined |
| insulation | prey    |         |

Animals have adaptations that help them survive in their environments. For example, birds such as the _____________ have thick layers of soft feathers to provide _____________ against the cold. The humps of camels store fat for when food is _____________ . Ocean animals are more _____________ than land animals so that they can swim faster.

Some adaptations developed because of predator- _____________ relationships. Skunks use bad-smelling _____________ that make predators avoid them. Prey can use _____________ to blend in with their environments. Some animals also demonstrate _____________ , the ability to look like another animal that a predator finds unpleasant. For example, some predators stay away from the viceroy butterfly because it mimics the bad-tasting monarch butterfly.
Meet Caroline Chaboo

Read the Reading in Science feature in your textbook.

Look at the chart below. In each row, read the information in the two “What I Know” columns. Use it to infer something that is not directly stated in the text. Write that statement in the “What I Infer” column.

<table>
<thead>
<tr>
<th>Clues</th>
<th>What I Know</th>
<th>What I Infer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Sabal palm stands up to high winds, drought, and driving rain in the __________________ region.</td>
<td>The Sabal palm is well-adapted for the Caribbean region.</td>
<td></td>
</tr>
<tr>
<td>2. The _________ beetle harms Sabal palm trees in regions where it lives.</td>
<td>The tortoise beetle lives in ____________ .</td>
<td></td>
</tr>
<tr>
<td>3. The tortoise beetle weakens the Sabal palm, but ______________.</td>
<td>Caroline Chaboo studies plants, such as the Sabal palm, to discover whether they have adapted natural protection against insect pests.</td>
<td></td>
</tr>
</tbody>
</table>
Write About It

Infer

1. How might a natural pesticide produced by the Sabal palm help other organisms?

2. Research tortoise beetles. What other plants do they eat? Write a report that tells how such a pesticide could help other plants.

Using Ideas to Infer

To answer question #1, first determine how a natural pesticide inside the Sabal palm would help the tree.

Then, write your answer to the question:
How might a natural pesticide in the Sabal palm help other organisms?

Planning and Organizing

Imagine that you have been told to research tortoise beetles to find out what other plants they eat.
In order to conduct this research, first list the types of sources that would contain this information.

a. ________________________________

b. ________________________________

c. ________________________________

Then, list key words you could use to look up the information in these sources.

a. ________________________________

b. ________________________________
Change over Time

Use your textbook to help you fill in the blanks.

What are variations?

1. Darwin studied different types of finches while visiting the ________________ .

2. The birds were similar in every aspect except for their ________________ , which were suited to different environments.

3. Darwin thought that the finches might all have come from one ________________ .

4. Variations that favor survival are ________________ likely to be passed on to the next generation, and variations that do not favor survival are ________________ likely to be passed on.

5. Variations can help a species live long enough to successfully ________________ .

What is natural selection?

6. In nature organisms compete for natural resources such as food, ________________ , sunlight, and space.

7. “Survival of the fittest” is another way to describe the process of ________________ .

8. Plants and animals have more offspring than their environments can support to ensure that enough will ________________ to carry the species into the future.
What is evidence of change over time?

9. The history of Earth’s changes can be found in ____________________.

10. Fossils can tell us about what an ____________________ was like in the past.

How old are fossils?

11. The ____________________ of a rock is how old it is compared to another rock.

12. The ____________________ is the age of a fossil in years.

Is Earth still changing?

13. New islands may form due to ____________________ activity.

14. Some species previously thought to be extinct are now ____________________.

Critical Thinking

15. If the climate were suddenly to become colder, what variations do you think would most help animals to survive?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

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Change over Time

Use the clues to fill in the crossword puzzle.

<table>
<thead>
<tr>
<th>absolute age</th>
<th>mutation</th>
<th>relative age</th>
</tr>
</thead>
<tbody>
<tr>
<td>fossil</td>
<td>natural selection</td>
<td>variation</td>
</tr>
</tbody>
</table>

**Across**

1. the age of a fossil in years
2. the age of a rock compared to another
3. the process that occurs when the organisms that are best suited to their environment survive and reproduce successfully
4. a difference among members of the same species that enables some individuals to better survive and reproduce
5. the remains, traces, or imprints of living things preserved in Earth’s crust
6. a change in an organism’s genetic material

**Down**

1. a difference among members of the same species that enables some individuals to better survive and reproduce

---

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Change over Time

Fill in the blanks.

<table>
<thead>
<tr>
<th>absolute age</th>
<th>fossils</th>
<th>resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>changed</td>
<td>Galápagos</td>
<td>variation</td>
</tr>
<tr>
<td>environments</td>
<td>reproduce</td>
<td></td>
</tr>
</tbody>
</table>

The first person to organize observations for the origin of species was Charles Darwin. While visiting the Islands, Darwin noticed that the beaks of different finches were suited to different types of food. He believed that the different types of finches all came from one . Over time the birds that lived on the different islands to adapt to their particular .

In order to survive, organisms must find enough to support life. Those that survive will successfully, and their species will continue. Sometimes a difference, mutation, or can help a species to survive. can indicate what past organisms and environments were like. The of rocks and fossils help explain how Earth has changed over its long history.
So You Want to Be a Fossil Hunter

Write About It

Descriptive Writing Select a fossil discovery and write a description of it. Use sensory words and specific details to describe characteristics about the organism such as what it ate, what it looked like, and its habitat. Does the fossil resemble any organisms that are alive today? How old is the fossil?

Getting Ideas

What fossil will you describe? Write its name in the center circle of the web below. Write details that describe the fossil in the outer circles. You can add circles to the web if you like.

Planning and Organizing

Jorge wants to describe a fossil of a dinosaur footprint. Here are some sentences that he wrote. Write Yes if the sentence describes the fossil. Write No if it does not.

1. The huge footprint was $2\frac{1}{2}$ feet across. ________

2. It showed that the dinosaur had three long, bony toes. ________

3. I got scared when I looked at the footprint. ________
Drafting
Write a sentence to begin your description. Tell what fossil you will describe. Tell an important idea about this fossil.

Now write your description. Use a separate piece of paper. Start with the sentence you just wrote. Then write your description. Use words that appeal to the senses. Use details that will help your readers picture the fossil.

Revising and Proofreading
Help Jorge improve his description. Add sensory words in the blanks. Choose a word from the box or pick your own.

| deep | gray | narrow | sharp | spiky |

The fossil footprint in the cold, ______________ stone reveals secrets of this creature that lived millions of years ago. The footprint had made a ______________ impression in the earth. This suggested that the dinosaur was very big and heavy. It showed long ______________ shapes at the end of the toes. Maybe this is where its ______________ claws dug into the earth. The heel of the foot was ______________, not wide.

Now revise and proofread your writing. Ask yourself:
- Did I include enough details to help readers picture the fossil?
- Did I use sensory words to bring my description to life?
- Did I correct all mistakes?
Heredity and Diversity

Choose the letter of the best answer.

1. Which of the following organisms reproduces by using budding?
   a. sponge  
   b. cat  
   c. lizard  
   d. frog

2. Which of the following plants reproduces by using runners?
   a. corn plant  
   b. moss  
   c. strawberry plant  
   d. apple tree

3. Which of the following is an example of sexual reproduction?
   a. cloning  
   b. budding  
   c. seed production  
   d. vegetative propagation

4. Which organism can develop from an unfertilized egg?
   a. human  
   b. sheep  
   c. bird  
   d. lizard

5. Which of the following is an advantage of asexual reproduction?
   a. It requires a mate.  
   b. It promotes species variety.  
   c. It is convenient.  
   d. It produces offspring that adapt easily to change.

6. A characteristic that helps an organism survive in its environment is a(n)
   a. trait.  
   b. style.  
   c. adaptation.  
   d. gene.

7. A type of camouflage in which the color of the animal blends in with its background is called
   a. protective coloration.  
   b. protective resemblance.  
   c. adaptation.  
   d. mimicry.

8. A butterfly that looks like a bad-tasting butterfly exhibits
   a. protective resemblance.  
   b. protective coloration.  
   c. hibernation.  
   d. mimicry.
Choose the letter of the best answer.

9. A walking stick insect looks like a stick. This is an example of
   a. protective coloration.
   b. protective resemblance.
   c. instinct.
   d. mimicry.

10. A difference that allows an individual to better reproduce is
    a. fossils.
    b. imprinting.
    c. variation.
    d. natural selection.

11. Which causes variation?
    a. climate staying the same
    b. a species having little room to expand
    c. all members of a species dying out
    d. mutation

12. Sick animals often do not live to reproduce. This is part of
    a. natural selection.
    b. inherited behavior.
    c. mimicry.
    d. camouflage.

13. What do fossils that are dated using the half-life of an element tell us about the rock in which they were found?
   a. relative age    c. half-life
   b. absolute age    d. position

14. The passing of traits to offspring is known as
    a. genetics.
    b. heredity.
    c. hibernation.
    d. adaptation.

15. Which of these represents a carrier for the recessive trait?
    a. DD    c. dd
    b. Dd    d. d

16. An instinct is an example of
    a. a learned behavior.
    b. an inherited behavior.
    c. an inherited physical trait.
    d. imprinting.

17. If purple is the dominant gene for flower color, which item represents a white flower?
    a. PP    c. Pp
    b. pp    d. p
Monarch Butterflies at Risk

Write About It

Response to Literature  In this article the author discusses monarch butterflies. What conditions affect these butterflies? What role does weather play? Think about a severe weather condition you have experienced. Write a personal narrative describing the severe weather and how it affected you and other people.
The Universe

Complete the concept map with information you learned about the universe.

The stages of a medium-sized star are nebula, protostar, star, ____________, and white dwarf.

Today, astronomers divide the sky into 88 ____________, or patterns of stars.

The Sun is the star at the center of our ____________.

Eight planets revolve around the Sun, including four ____________ and four ____________.

The terrestrial planets have surfaces made of ____________.

The four planets furthest from the Sun have surfaces made of ____________ and are very different from one another.
The Inner Planets

Use your textbook to help you fill in the blanks.

What are planets?

1. A __________________ is made up of a star and the objects that surround it.
2. Large objects that orbit stars are called __________________.
3. Some planets have objects called __________________ that orbit them.
4. Our solar system includes eight planets that orbit the __________________.
5. Most of the solar system’s __________________ orbit the Sun in a belt between Mars and Jupiter.
6. The planet closest to the Sun is __________________, and the planet farthest away from the Sun is __________________.

What do we know about Mercury, Venus, and Earth?

7. Mercury, Venus, Earth, and Mars are planets with surfaces made of __________________.
8. Mercury takes 88 Earth days to make one __________________ around the Sun.
9. Venus has an atmosphere made mostly of __________________, which holds in heat and gives this planet the hottest surface in the solar system.
10. The most noticeable feature about __________________ is that it is covered in water.
What is Mars like?

11. The fourth planet in our solar system is called ______________.

12. Phobos and Deimos are the names of Mars’s ______________.

13. The reddish ______________ in Mars’s atmosphere makes its sky look pink.

Critical Thinking

14. Why do you think many of the craters on Earth are no longer visible?

____________________________________________________

____________________________________________________
**The Inner Planets**

Match the correct letter with the description and fill in the crossword puzzle.

<table>
<thead>
<tr>
<th>asteroid</th>
<th>planet</th>
<th>rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>moon</td>
<td>revolution</td>
<td>solar system</td>
</tr>
</tbody>
</table>

**Across**

4. a rock that revolves around the Sun in a belt between Mars and Jupiter

5. a star and the objects that orbit it

**Down**

1. a large object that orbits a star but does not give off its own light

2. one complete trip around the Sun

3. a complete spin on an axis

6. a natural object that orbits a planet
The Inner Planets

Fill in the blanks.

<table>
<thead>
<tr>
<th>asteroids</th>
<th>Earth</th>
<th>Mercury</th>
<th>terrestrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>craters</td>
<td>Mars</td>
<td>none</td>
<td>Venus</td>
</tr>
</tbody>
</table>

The major objects of the solar system are eight planets that orbit the Sun and their moons. Earth is one of the ____________ planets, which have rocky surfaces. Many of the inner planets have surfaces with large _____________. Earth has one moon, some planets (such as Mercury and Venus) have _____________, and other planets (such as Jupiter and Saturn) have dozens.

Other objects in the solar system include the ____________ that orbit the Sun between _____________ and Jupiter. Scientists study ____________ to learn about the inner planets because they are made of the same kinds of materials. ____________ has some of the hottest surface temperatures in the solar system because of its thick carbon dioxide atmosphere. ____________ is sometimes hard to see from Earth because it is so close to the Sun. Astronomers study the solar system with many types of telescopes.
The Outer Planets

Use your textbook to help you fill in the blanks.

What are the outer planets?

1. The ___________ planets are much larger than the ___________ planets.
2. Jupiter, Saturn, Uranus, and Neptune are planets with surfaces made of ___________.
3. ___________ is the largest planet in the solar system; it has more mass than all the other planets combined.
4. Jupiter completes one ___________ in 4,333 Earth days.
5. Ganymede, Callisto, Io, and Europe are Jupiter’s ___________.

What are Saturn and Uranus like?

6. The most noticeable feature about Saturn is its large set of ___________ that are made of ice and rock.
7. Saturn ___________ once every 10 hours and 39 minutes.
8. Uranus is unusual because its ___________ of rotation makes it look like it was knocked on its side.
What are Neptune and dwarf planets like?

10. The planet farthest from the Sun is ________________.

11. Neptune has some of the strongest ________________ of any planet in the solar system—speeds have been recorded at 2,000 kilometers per hour (1,250 miles per hour).

12. Pluto was once considered a planet even though its diameter is only two-thirds the size of ________________.

13. The dwarf planet ________________ is slightly larger than Pluto and takes 557 Earth-years to orbit the Sun.

Critical Thinking

14. Why is it not possible to land a spacecraft on Jupiter or Saturn?

________________________________________________________________________

________________________________________________________________________
The Outer Planets

Who am I? What am I?

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

- a. rings
d. the Great Red Spot
g. dwarf planet
- b. comet
e. methane
- c. Galilean moons
f. Triton

1. ____ I am a ball of rock and ice that orbits the sun. What am I?

2. ____ I am the area of Jupiter that has enormous and powerful storms. What am I?

3. ____ I am one of four large objects that orbits Jupiter. I was discovered by Galileo with his telescope. What am I?

4. ____ I can be found orbiting all the outer planets, but I am more noticeable around Saturn. I am made of ice and rocks. What am I?

5. ____ I give Neptune its blue color. What am I?

6. ____ I am a moon of Uranus. I have some characteristics in common with Earth. What am I?

7. ____ My name is Pluto. What am I?
The four outer planets share many properties. They are all very large, are mostly made of ________, and rotate very fast. ________ is a ball of gas so large that more than 1,000 Earths could fit inside it. Saturn has a recognizable series of rings made of ________ that orbit the planet. Some scientists believe these rings may be the remains of ________ that collided with or near Saturn.

Uranus’s ________ is tipped so far that it looks like it is rotating on its side. It may have been struck by some object and knocked on its side. Neptune’s layers of gas include large amounts of ________, which gives the planet its blue color. Pluto, Eris, and other ________ are smaller than some of the moons of the planets in the solar system. ________ takes over 557 Earth-years to revolve around the Sun.
Voyager Discoveries

Read the following passage.

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

Voyager Spacecraft Travel

Jupiter—1979:
Images show Jupiter’s rings. Volcanic activity is observed on Io, one of Jupiter’s moons.

Saturn—1980–91:
Scientists get a close look at Saturn’s rings. They contain structures that look like spokes, or braids. Scientists observed that Titan, one of Saturn’s moons, has a thin atmosphere and active, geyser-like landforms.

Uranus—1986:
Voyager photographs the dark rings around Uranus. It also sees ten new moons, bringing Uranus’s total to 15 moons. Voyager sends back detailed images and data on the planet, its moons, and dark rings.

Neptune—1989:
Large storms are seen on the planet. One of these storms is Neptune’s Great Dark Spot. Neptune was originally thought to be too cold to support this kind of weather.
After observing these planets, the Voyager spacecraft keep traveling. They are the first human-made objects to go beyond the heliosphere. The heliosphere is the region of space reached by the energy of our Sun. It extends far beyond the most distant planets in the solar system.

Write About It
Cause and Effect

▷ What caused the Voyager spacecraft to be propelled from one planet toward the next?
▷ How did scientists benefit from the Voyager missions?

1. What caused the Voyager spacecraft to be propelled from one planet toward the next?

2. How did scientists benefit from the Voyager missions?
Stars

Use your textbook to help you fill in the blanks.

What are stars?

1. Stars form from a huge cloud of gases and dust called a(n) ________________ .

2. When the cloud contracts and powerful reactions start to turn hydrogen atoms into helium atoms to produce energy, a(n) ________________ forms.

3. After billions of years, the hydrogen fuel of a star begins to run out and the star expands to become a(n) ________________ .

4. A star that begins life with much more hydrogen than a medium-sized star such as our Sun ends its life as an exploding star called a(n) ________________ .

How are stars characterized?

5. A star’s ________________ is the star’s actual brightness.

6. A star’s ________________ is how bright the star appears in Earth’s night sky.

7. The Sun is a medium-sized ________________ star with a surface temperature of about 6,000°C.

8. By using gravitational microlensing, scientists have discovered ________________ outside our solar system.
What are constellations?

9. Patterns of stars in the sky are ____________________.

10. ____________________, the North Star, is located in the Little Dipper constellation.

What are star charts?

11. Astronomers have created maps of the night sky called ____________________.

12. ____________________ is how far north or south a star is from the equator.

13. ____________________ is how far around the map the star is.

Why do constellations seem to move?

14. The constellations appears to move because the Earth is ____________________ on its axis.

Critical Thinking

15. Will the Sun always shine?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Stars

Match the correct letter with the description.

1. An exploding star is a(n) ______.
2. An object in space that produces its own energy, including heat and light, is a(n) ______.
3. A map of the night sky is called a(n) ______.
4. A huge cloud of gases from which stars form is a(n) ______.
5. A group of stars that forms a pattern is a(n) ______.
6. A small, very dense star is a(n) ______.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>constellation</td>
<td>c.</td>
<td>nebula</td>
</tr>
<tr>
<td>b.</td>
<td>star chart</td>
<td>d.</td>
<td>star</td>
</tr>
</tbody>
</table>

1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
Stars

Fill in the blanks.

A star is an object that produces its own _________________. The ________________ is an average star with planets in ________________ orbits around it. Planets have been discovered around other stars using ________________.

Like living things, stars have life cycles. Stars are born from clouds of gas called _________________. When gravity causes nebulas to contract enough, temperature rises and reactions that change hydrogen into ________________ start. When the helium is also gone, the star shrinks and cools to become a _________________. The life cycle of a medium-size star, such as our Sun, is about ________________ years. Our Sun is about 5 billion years old.
The Universe

Choose the letter of the best answer.

1. The Sun and all the objects that orbit it make up the
   a. moon.
   b. solar system.
   c. nebula.
   d. universe.

2. What is an orbit?
   a. the speed of a planet moving around the Sun
   b. the order of planets in distance from the Sun
   c. the path a planet takes as it moves around the Sun
   d. the tilt of Earth on its axis

3. A comet is usually made of
   a. spinning gas.
   b. rock and ice.
   c. hydrogen and helium.
   d. red dust.

4. What is Earth’s revolution?
   a. its spinning motion on its axis
   b. its lunar gravitational pull
   c. its changing of seasons
   d. its movement in orbit around the Sun

5. Callisto, Io, Europa, and Ganymede are the
   a. asteroid belt.
   b. Galilean moons.
   c. constellations.
   d. dwarf planets.

6. A small, dense star that forms at the end of a medium star’s life cycle is a
   a. white dwarf.
   b. red giant.
   c. nebula.
   d. blue protostar.

7. A distant group of stars that form a pattern are known as a(n)
   a. solar system.
   b. universe.
   c. nebula.
   d. constellation.
8. The explosion of a star is called
   a. a nebula.
   b. a supernova.
   c. a protostar.
   d. gravitational microlensing.

9. A natural object that orbits a planet is a(n)
   a. asteroid.
   b. comet.
   c. moon.
   d. star.

10. In the solar system, most asteroids are
    a. beyond Neptune.
    b. orbiting Saturn.
    c. between Mars and Jupiter.
    d. next to the Sun.

11. The largest planet in our solar system is
    a. the asteroid belt.
    b. Jupiter.
    c. the Sun.
    d. the Moon.

12. What is absolute magnitude?
    a. the actual brightness of a star
    b. how far north or south from the equator a star appears
    c. the position of a star on a star chart
    d. the way a star looks in Earth’s night sky

13. Stars form from a cloud of gas called a
    a. constellation.
    b. nebula.
    c. universe.
    d. neutron star.

14. The Sun is a
    a. yellow star.
    b. neutron star.
    c. white dwarf.
    d. red giant.

15. What is the name of the process by which distant planets are found as they pass in front of stars?
    a. The Gravitational Microlensing Method
    b. The Stellar Life Cycle Theory
    c. The Big Bang Theory
    d. The Expanding Universe Theory
Our Dynamic Earth

Complete the concept map by filling in answers where blanks appear.

- **Forces that Change Earth’s Surface**
  - Plate Movements
    - Move toward each other
    - Move over hot spots
    - Changes in Atmosphere
      - Weather follows a pattern
        - constantly move ocean water, affecting how areas receive heat and moisture

- **Happens every two to _______ years**
- **Winds reverse directions, moving most air and causing _______**
- **Island _______**
- **_______ mountains**
- **_______ Mid-ocean**
- **_______ Earthquakes**
Plate Tectonics

Use your textbook to help you fill in the blanks.

What are Earth’s layers?

1. The center part of Earth is made up of two parts the molten outer core and the _________________ inner core.
2. The layer above the core is called the _________________.
3. Continents and the ocean floor are part of Earth’s solid, rocky surface called the _________________.

Are the continents moving?

4. Alfred Wegener stated that Earth’s _________________ were once joined in one landmass, but gradually pulled apart and drifted.
5. Wegener’s showed that the age and composition of rocks in the _________________ on South America’s east coast matched those on Africa’s west coast.
6. Scientists also discovered evidence in _________________ that Africa and South America were once joined.

What causes the ocean floor to move?

7. Scientists developed the _________________ theory to explain how the continents have moved over millions of years.
8. Earth’s lithosphere is made of huge pieces of solid rock called _________________.
9. Melted rock called _________________ rises up through the crack where plates move apart under the ocean.
10. As the ocean floor spreads at the plate boundary, the
   ________________ resting on the plates also move
   apart.

What forces change Earth’s crust?

11. The force that causes rocks to break as plates rub past
   each other is called ________________.

12. A break or crack in the rocks of the lithosphere
    along which movements take place is called a(n)
    ________________.

13. Three types of faults include a strike-slip fault, a(n)
    ________________ fault, and a reverse fault.

What are the different types of mountains?

14. When plates push together, compression causes the
    ground to form ________________ mountains.

15. A mountain range in Asia, the ________________,
    began to form millions of years ago as folded mountains.

16. When rock on one side of a fault moves down and rock
    on the other side moves up, a ________________
    mountain is formed.

Critical Thinking

17. Compare how two types of mountains are formed.

   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________
Plate Tectonics

Use the terms in the box below to fill in the blanks.

- core
- magma
- fault
- mantle
- geological features
- plate tectonics
- hydrosphere

1. Earth has several layers. The planet itself is divided into the crust, the ______________ beneath it, and the core at the center.

2. The ______________ is made up of Earth’s liquid and solid water, including oceans, lakes, rivers, glaciers, and underground water.

3. Hot, melted rock is called ______________.

4. A ______________ is a crack in the rock of the lithosphere, along which movements take place.

5. The physical features of Earth are part of Earth’s surface. Earth’s surface has many types of ______________.

6. At the center of the Earth is its ______________.

7. The model that states that Earth’s surface is composed of large rock plates that fit together like jigsaw puzzle pieces is called ______________.
Plate Tectonics

Fill in the blanks.

<table>
<thead>
<tr>
<th>compression</th>
<th>continents</th>
<th>fossils</th>
<th>shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>continental drift</td>
<td>folded</td>
<td>plate tectonics</td>
<td></td>
</tr>
</tbody>
</table>

The continents were not always where they are today. About 100 years ago, Alfred Wegener developed the theory of ______________ . The theory states that Earth’s ______________ were once one landmass. The landmass broke up millions of years ago, and the continents drifted to the positions we know today. Wegener supported his theory with evidence from rocks and ______________ . Later, scientists developed the theory of ______________ .

When plates push together, they produce the force of ______________ . This force can push the ground at the boundary upward, forming ______________ mountains.

When plates slide past each other, they create ______________ . This force can make huge blocks of crust break apart along faults. Over millions of years, the blocks can shift upward to form fault-block mountains.
Pangaea and Other Supercontinents

Write About It
Expository Writing Research the movement of Rodinia and Pannotia. Select a main idea. Write an expository essay with details that support your main idea.

Getting Ideas
Do some research to find out whether Rodinia and Pannotia actually existed. Use the chart below. In the boxes on the top, write details that you find. In the box on the bottom, summarize this information.

Planning and Organizing
Here are two sentences that Mai wrote. Write Yes if the sentence supports the idea that Rodinia and Pannotia actually existed. Write No if it does not.

1. There are common rock types and structural features along the coastlines of continents today. ______

2. Figuring out how supercontinents formed and broke apart is a lot like detective work. ______
Drafting
Write a sentence to begin your essay. This sentence should tell your main idea about Rodinia and Pannotia.

Review the evidence you found and your summary. Now write the first draft of your essay. Use a separate piece of paper. Include facts and details that back up your main idea. Draw a conclusion at the end.

Revising and Proofreading
Help Mai revise her writing. Use the word *but* to combine each pair of sentences. Put a comma before this word. Write the new sentence on the lines.

1. Pangaea was a supercontinent. It was not the earliest supercontinent.

2. Rodinia and Pannotia were both supercontinents. They were formed at different times.

Now revise and proofread your writing. Ask yourself:
- Did I clearly state my main idea?
- Did I include facts and details to back up my idea?
- Did I reach a sound conclusion at the end?
- Did I correct all mistakes?
Volcanoes

Use your textbook to help you fill in the blanks.

Where are volcanoes found?

1. Most of Earth’s volcanoes are located at edges of ________________.

2. A string of volcanoes at plate boundaries around the Pacific Ocean is known as the ________________.

3. Volcanoes often erupt at places where one plate is ________________ the other.

4. The bottom edge of the diving plate melts in the heat of the ________________.

5. The melted rock rises within the crust, forming a hot pool of ________________.

6. The hot rock sometimes erupts through openings in Earth’s surface as a(n) ________________.

7. Magma that reaches Earth’s surface is ________________.

How does magma form geological features?

8. When magma hardens inside Earth’s crust, it can form vertical ________________ and horizontal sills.

9. Magma pushed into a thick sill can form a(n) ________________.

10. The largest underground magma formations are ________________, which can form large hills.
11. A volcano that is ______________ can erupt with lava, ash, gas, or rock.

12. When a volcano stays quiet for a time, it is ______________ .

13. A volcano that no longer erupts is ______________ , or dead.

How do volcanoes build islands?

14. The Hawaiian Islands formed over a stationary pool of magma below Earth’s crust called a(n) ______________.

15. When the mountains grew high enough to break the ocean’s surface, they became volcanic ______________.

16. As the plate moved slowly the islands moved ______________ from the hot spot.

17. Where two ocean plates meet and one is pushed under the other, an island ______________ may form.

18. Magma from the edge of the lower plate rises and builds volcanic islands along the plate ______________.

19. An example of an island arc is the ______________ in Alaska.

Critical Thinking

20. Why do volcanoes form when one plate pushes under another?

_________________________________________________________________________________________

_________________________________________________________________________________________

_________________________________________________________________________________________
Volcanoes

Match the correct letter with the description.

1. ______ magma that reaches Earth’s surface
2. ______ a series of volcanic islands that form along a plate boundary
3. ______ a broad volcano with gently sloping sides formed from thin, fluid lava
4. ______ an opening in Earth’s crust through which magma flows
5. ______ a stationary pool of magma below Earth’s crust
6. ______ a large, cone-shaped volcano built from alternating layers of cinders and hardened lava
7. ______ a line of islands
8. ______ a cup-shaped depression that forms around a volcano’s vent
9. ______ a cone-shaped volcano of cinders, with a narrow base and steep sides
Volcanoes

Fill in the blanks.

<table>
<thead>
<tr>
<th>cinder-cone</th>
<th>lava</th>
<th>plates</th>
<th>volcano</th>
</tr>
</thead>
<tbody>
<tr>
<td>composite</td>
<td>mantle</td>
<td>shield</td>
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</table>

Openings on the Earth’s surface appear on the edges of the crust’s plates. An opening in Earth’s crust from which magma flows is a(n) _______________. Most volcanoes form in places where _______________ push toward each other, and one dives under the other. The lower edge of the diving plate melts in the _______________, producing hot magma that rises in the crust. Magma that breaks through to Earth’s surface is _______________.

There are three types of volcanic mountains. A large, broad mountain composed of hardened lava is a(n) _______________ volcano. A narrow, steep mountain formed from cinders is a(n) _______________ volcano. A large, cone-shaped mountain formed by layers of lava and cinders is a(n) _______________ volcano. Volcanoes are built up over time as more material is deposited.
Earthquakes

Use your textbook to help you fill in the blanks.

What is an earthquake?

1. Earthquakes happen when the layers of rock on both sides of a(n) ________________ suddenly slip.

2. Waves of energy spread out from the ______________________, the place where the slipping began.

3. When they reach the surface, waves spread out from the ________________ of the earthquake (the point directly above the focus).

4. Most earthquakes happen at faults that are near the boundaries of ________________.

What waves do earthquakes make?

5. Scientists use a(n) ________________ to detect and measure earthquake waves.

6. The fastest earthquake waves, ________________ waves, pass through solids and liquids and move back and forth.

7. An earthquake’s ________________ waves move up and down and from side to side.

8. The slowest-moving waves, ________________ waves, move across Earth’s surface like ripples on a pond.

How is an earthquake’s energy measured?

9. Scientists use the ________________ scale to measure earthquake magnitude.

10. A measure of the amount of ________________ that an earthquake releases is magnitude.
11. Scientists use the ________________ scale to measure an earthquake’s effects.

12. An underwater earthquake can produce a large wave called a(n) ________________.

13. Underwater earthquakes with a magnitude of ________________ or greater on the Richter scale are most likely to cause tsunamis.

How can people prepare?

14. Layers of rubber and steel between a building and its foundation allow the building to ________________, reducing the damage caused by up-and-down motions.

15. Before an earthquake, people should ________________ objects that might fall.

16. In their attempt to tell when earthquakes might happen, scientists look for possible warning signs such as changes in the angle of the ________________.

17. Earthquakes are hard to ________________, but the ability to do so would allow early warnings that could save lives.

Critical Thinking

18. Which scale do you think would better explain an earthquake to you—the Richter scale or the Mercalli scale? Why?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Earthquakes

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

Vocabulary

Earthquake

1. A sudden movement of Earth’s crust is a(n) _________________.
2. The point on the surface directly above an earthquake’s focus is its _________________.
3. A crack in Earth’s crust is a(n) _________________.
4. The place along a fault where the slipping that causes an earthquake begins is the earthquake’s _________________.
5. A measure of the energy that an earthquake releases is its _________________.
6. A large ocean wave caused by an underwater earthquake is a(n) _________________.
7. The scale that measures the magnitude of an earthquake is called the _________________. scale.
Earthquakes

Fill in the blanks.

- earthquake
- energy
- fault
- Mercalli
- primary or P
- Richter
- secondary or S

The plates of the Earth are in motion. A sudden movement of Earth’s crust is an earthquake. Most earthquakes occur near plate boundaries, when layers of rock that usually adhere to each other suddenly slip at a fault. The scale that measures the magnitude of an earthquake is called the Richter scale. The scale that measures how severe an earthquake feels and the amount of damage the quake does to objects is called the Mercalli scale.

The movement of plates during an earthquake sends out waves of energy that shake the ground. When an earthquake occurs, primary or P waves move forward and back very rapidly. An earthquake’s secondary or S waves move up and down. The slowest waves are surface or L waves. These waves cause the most damage.
Quake Predictors

Read the Reading in Science feature in your textbook. Look for clues in the article that help you draw conclusions about earthquakes.

Draw Conclusions
Use the graphic organizer to draw conclusions.

<table>
<thead>
<tr>
<th>Text Clues</th>
<th>Conclusions</th>
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</table>
Write About It

Draw Conclusions
1. Before the invention of the seismometer, how do you think people measured earthquakes?
2. Why are satellites a useful source of information about movement on Earth’s surface?

Planning and Organizing
Explain one way to measure earthquakes that people could have used before the seismometer was invented.

Drafting
Now draw a conclusion about how satellites provide information about movements on Earth’s surface.
The Atmosphere

Use your textbook to help you fill in the blanks.

What are weather and climate?

1. Two variables that are important in determining climate are ________________ and ________________.
2. The global variable that has the strongest effect on climate is ________________.

How do oceans affect temperature on land?

3. Air in contact with ________________ is warmed in the winter and cooled in the summer.
4. The movement of air from water to land is called a(n) ________________.
5. The movement of air from land to water is called a(n) ________________.

How do mountains and ocean currents affect climate?

6. A(n) ________________ is a constant movement of ocean water.
7. Areas near ________________ currents tend to have ________________ temperatures while areas near ________________ currents tend to have ________________ temperatures.
9. The temperature of an inland city is usually ___________________ in summer and ___________________ in winter than the temperature of a coastal city.

10. At a given latitude, the higher the altitude, the ___________________ the climate.

11. The climate on the ___________________ side of a mountain is wetter and cooler than the climate on the ___________________ side.

What is El Niño?

12. A cold current along the coast of Peru causes air pressure to be ___________________ in the eastern Pacific than it is in the western Pacific.

13. El Niño brings ___________________ to the coasts of North and South America; La Niña brings ___________________ to these coastal areas.

Critical Thinking

14. Location A is near the equator on the windward side of a mountain. Location B is at 30°N latitude on the east side of the Atlantic Ocean. Describe the climate in each location. Explain your answers.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
The Atmosphere

Choose a word from the word box below to complete the puzzle.

| atmosphere | current | rain shadow |
| climate    | El Niño | weather     |

**Across**

5. layer of gases that surrounds Earth
6. causes rain and storms every two to seven years

**Down**

1. average weather of a place
2. dry area on the leeward side of a mountain
3. condition of the troposphere at a particular time and place
4. constant movement of ocean wave
The type of weather that exists in a place over the long term is its climate. The two most important variables that determine climate are __________________ and __________________. It is possible to predict the climate of an area if you know its __________________.

Areas near the equator have _______________ climates and the highest temperatures. They also have heavy precipitation during at least part of the year. Areas between 23.5° and 66.5° latitudes (whether north or south) have temperate climates. Other factors that affect climate are distance from a(n) _________________, _________________, and _________________. All of these factors can give you a general idea of the climate of an area.
Our Dynamic Earth

Choose the letter of the best answer.

1. Which is a geological feature on Earth’s surface?
   a. tsunami
   b. volcano
   c. mantle
   d. hot spot

2. The crust and the top part of the mantle make up the
   a. atmosphere.
   b. hydrosphere.
   c. asthenosphere.
   d. lithosphere.

3. Earth’s surface layer is the
   a. mantle.
   b. crust.
   c. biosphere.
   d. asthenosphere.

4. What layer of Earth’s interior lies just below the crust?
   a. mantle
   b. inner core
   c. lithosphere
   d. outer core

5. The plate tectonics model states that Earth’s crust is composed of
   a. one solid piece of rock.
   b. both liquid and frozen water.
   c. huge plates of solid rock that fit together.
   d. hot, melted rock.

6. What is a fault?
   a. energy that an earthquake produces
   b. the opening in a volcano
   c. a large crack in Earth’s crust
   d. the boundary between two plates

7. Huge slabs of rock moving suddenly against each other in the Earth’s crust create
   a. earthquakes.
   b. abyssal plains.
   c. volcanos.
   d. a trench stretch.
8. A volcano is  
   a. an opening in Earth’s crust through which magma flows.  
   b. any mountain near a plate boundary.  
   c. a group of hot spot faults  
   d. movement at a fault.

9. Almost all weather occurs in the  
   a. stratosphere.  
   b. asthenosphere.  
   c. troposphere.  
   d. lithosphere.

10. The dry area on the leeward side of a mountain is called  
    a. the windward side.  
    b. a rain shadow.  
    c. the attitude.  
    d. a land breeze.

11. What is the term used for melted rock that reaches the Earth’s surface?  
    a. lava  
    b. mantle  
    c. magma  
    d. boundary rock

12. This device is used to detect and measure earthquake waves.  
    a. wavometer  
    b. richtometer  
    c. barometer  
    d. seismometer

13. The average weather in a place is called the  
    a. climate.  
    b. atmosphere.  
    c. temperature.  
    d. magnitude.

14. Underwater earthquakes of a great magnitude can create  
    a. continental divides.  
    b. trenches.  
    c. tsunamis.  
    d. aquatic drift.

15. The measure of the weight of air pressing down on an area is called  
    a. air pressure.  
    b. temperature.  
    c. precipitation.  
    d. rain shadow.
Understanding Earthquakes

Read the Literature feature in your textbook.

Write About It

Response to Literature  This article describes the study of earthquakes over the centuries. It explains how human knowledge about earthquakes has changed. Research a major earthquake that occurred in the past. Then write an essay describing the earthquake and its effects on people’s lives.
Properties of Matter

Matter

contains different types of:

is made of:

has certain:

density

volume

metal
Matter

Use your textbook to help you fill in the blanks.

What is matter made of?

1. A substance that cannot be broken down chemically into simpler substances is a(n) _________________.

2. Water can be broken down into _________________ and _________________.

3. Most elements are solid, some are gases, and a few are ________________ at room temperature.

4. Today we know that a(n) _________________ is the smallest unit of an element that has that element’s properties.

What are atoms and molecules made of?

5. The center of an atom is its _________________.

6. Because an atom has the same number of _________________ and electrons, the atom has no overall charge.

7. An atom’s nucleus contains particles called protons that have a positive charge and particles called _________________ that have no charge.

8. Negatively charged particles called _________________ move around the nucleus.

9. The number of protons in an atom is that atom’s _________________.

Name ___________________________ Date ___________
10. An atom’s protons and neutrons have about the same mass. Electrons are ______________ and have about 1,800 times less mass than protons and neutrons.

11. The mass of all particles of an atom added together is its ______________.

12. Two or more atoms joined into a single particle form a(n) ______________.

13. Molecules have properties that are different than the ______________ that form them.

How are elements grouped?

14. Dmitri Mendeleev created the ______________ of elements.

15. The table’s columns group elements according to their ______________.

How do we examine elements?

16. A single ______________ atom is only 0.000000001 meters across.

17. Some microscopes use ______________ instead of light particles to examine a sample.

Critical Thinking

18. What is matter made of?

________________________________________________________________________________

________________________________________________________________________________
Matter

Read each clue. Write the answer in the blanks using the words below.

<table>
<thead>
<tr>
<th>atom</th>
<th>element</th>
<th>molecule</th>
<th>nucleus</th>
</tr>
</thead>
<tbody>
<tr>
<td>electron</td>
<td>mass</td>
<td>neutron</td>
<td>proton</td>
</tr>
</tbody>
</table>

1. The smallest unit of an element that retains that element’s properties is a(n) ____________________.

2. The particle in an atom that has a negative charge is a(n) ____________________.

3. A substance that chemical reactions cannot break down into something simpler is a(n) ____________________.

4. When you add up all the particles in an atom you can find its atomic ____________________.

5. Two or more atoms that are joined into one particle are a(n) ____________________.

6. In the nucleus of an atom, a particle that has no electrical charge is a(n) ____________________.

7. The center of an atom is its ____________________.

8. In the nucleus of an atom, a particle that has a positive electrical charge is a(n) ____________________.
Matter

Fill in the blanks.

<table>
<thead>
<tr>
<th>atoms</th>
<th>elements</th>
<th>nucleus</th>
<th>properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>electrons</td>
<td>neutrons</td>
<td>periodic table</td>
<td>temperature</td>
</tr>
</tbody>
</table>

Every substance on Earth is made of one or more _____________. Dmitri Mendeleev created the _____________ in the 1860s. It groups elements according to their _____________. One important property of an element is its state at room _____________. Another is the way that it combines or mixes chemically with other elements.

Each element is composed of tiny particles called _____________, the smallest units that retain the element’s properties. All atoms have the same parts. The center of an atom is its _____________. The nucleus contains protons and _____________. Atoms also contain _____________, which move around the nucleus. Protons and neutrons have a much larger mass than electrons do.
Meet Adriana Aquino

Read the Reading in Science feature in your textbook.

Main Idea and Details
Use the graphic organizer to list the main idea and the details of the article.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Write About It

Main ideas and Details
1. Tell how fish that live in Arctic and Antarctic oceans are able to keep from freezing.
2. Explain what would happen if one of these fishes did not have this adaptation to the cold water.
3. Research and explain other adaptations that allow fishes in cold environments to survive.

Planning and Organizing
Write a brief description of Adriana Aquino's job. What does she do while performing this job?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Write a brief summary of the animal adaptation that is discussed in this article.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Drafting
Now explain why fish in Arctic and Antarctic oceans do not freeze. Then explain what would happen if these adaptations were not present.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
Physical Properties

Use your textbook to help you fill in the blanks.

What are physical properties?

1. Color is an example of a(n) ________________ because color can be observed without changing the identity of the substance.

2. The amount of matter in an object is its ________________.

3. A measure of how strongly gravity pulls on an object is the object’s ________________.

4. The greater the ________________ of an object, the greater its weight.

5. Weight is measured in ________________.

6. The amount of space an object takes up is its ________________.

7. To measure liquid volume in ________________, scientists use tools such as beakers or graduated cylinders.

8. The volume of solids is measured in ________________.

9. Anything that has mass and volume is ________________.

What is density?

10. The amount of mass for each milliliter of a substance is that substance’s ________________.

11. To calculate density, divide an object’s ________________ by its ________________. 
12. If an object covers a large enough area of the water’s surface, it can float on the water because of the __________ of water particles.

What are metals, nonmetals, and metalloids like?
13. Most ________________ are shiny, malleable, ductile, and good ________________.
14. ________________ conduct electricity better than ________________ but not as well as metals, so they are called ________________.

How are atoms arranged in different states of matter?
15. Matter can exist as a solid, a(n) ________________, or a gas.
16. A liquid has a definite ________________, but it takes the shape of the container holding it.
17. A gas does not have a definite volume or a definite ________________.

Critical Thinking
18. How can matter be described?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
Physical Properties

Fill in the crossword puzzle from the clues below.

Across
1. an object’s resistance to sinking
3. how strongly gravity pulls on an object
5. something that allows heat and electricity to flow easily
7. the amount of matter in an object

Down
2. the amount of space that matter takes up
4. can be observed without changing the identity of the object
6. the amount of mass for each unit of volume of a substance
Physical Properties

Fill in the blanks.

buoyancy  float  properties  solid
constant  gas  push  volume
density  mass  sink  weight

We describe matter in a number of ways. Matter can exist as an \(\text{________} \), a liquid, or an \(\text{________} \). Scientists use these and other \(\text{________} \) to identify matter.

The amount of matter in an object is the object’s \(\text{________} \), a property that is \(\text{________} \). However, the \(\text{________} \) of an object changes as the force of gravity changes. The amount of space that an object takes up is its \(\text{________} \). Scientists also measure the amount of matter for each milliliter of a substance, or its \(\text{________} \). An object’s resistance to sinking is \(\text{________} \). When an object is placed on a fluid, the object and the fluid \(\text{________} \) against each other. If the fluid is denser, the object will \(\text{________} \). If the object is denser, the object will \(\text{________} \).
Changes of State

Use your textbook to help you fill in the blanks.

**How can matter change state?**

1. Altering the form or organization of an object without changing the type of matter within it is called a(n) __________________________.

2. The three states of matter are __________________________, liquid, and __________________________.

3. The state of matter of an object is a(n) __________________________ property.

4. The average vibration of molecules in an object is measured by __________________________.

5. When a solid gains heat energy, its molecules begin vibrating too quickly to stay together, so the solid becomes a(n) __________________________.

6. When gases lose heat, they __________________________ into liquids.

7. A liquid loses heat and __________________________ into a solid.

8. When a solid changes directly into a gas, it __________________________.

9. Most liquids become __________________________ when they change to a solid.
When does matter change state?

10. When a substance melts or boils, it absorbs ____________________.
11. The temperature at which a substance changes from a solid to a liquid is its ________________.
12. The temperature at which a substance changes from a liquid to a gas is its ________________.
13. The temperature at which a substance changes from a liquid to a solid is its ________________.
14. Nonmetals are weakly attracted to one another, so they have ________________ melting and boiling points.
15. The slow change from a liquid to a gas at temperatures below the boiling point is called ________________.

What are expansion and contraction?

16. An increase in an object’s volume when it is heated is called ________________; a decrease in its volume when it is cooled is called ________________.

Critical Thinking

17. How does water change when heat is added or removed?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Changes of State

Choose words from the word box below to finish the crossword puzzle.

boiling point  evaporation  sublimation
condensation  melting point  thermal expansion

Across
1. an increase in an object’s volume because of a change in temperature
4. temperature at which a water changes from a liquid to a gas
5. a slow change from a liquid to a gas
6. the temperature at which water changes from a solid to a liquid

Down
2. the changing of a gas into a liquid
3. a change from a solid to a gas
Changes of State

Fill in the blanks.

<table>
<thead>
<tr>
<th>boiling point</th>
<th>heat</th>
<th>solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>freezing point</td>
<td>liquid</td>
<td>sublimation</td>
</tr>
<tr>
<td>gas</td>
<td>melting point</td>
<td>temperature</td>
</tr>
</tbody>
</table>

All substances have three common forms called physical states. These states are ________________, liquid, and ________________. The physical state of matter is changed when ________________ is added or taken away. A measure of the average energy that a substance has (the average vibration of its molecules) is its ________________. When a solid is heated to its ________________, its molecules start moving faster, and the solid changes into a(n) ________________. When the liquid is heated to its ________________, its molecules move even faster, and the liquid turns into a gas. The melting point of water is 0°C, and its boiling point is 100°C. Sometimes a solid changes directly into a gas without passing through the liquid state, a process called ________________. When a liquid is cooled to its ________________, it becomes a solid. When a gas is cooled, it condenses and becomes a liquid.
Chemical Properties

Use your textbook to help you fill in the blanks.

What are chemical properties?

1. In addition to physical properties, substances have _______________ that describe how a substance reacts with other substances.

2. The location of an element on the _______________ can be used to determine the chemical properties of an element.

3. The soft and extremely reactive metals located in the far-left column of the periodic table are the _______________.

4. The large group of elements that react _______________ and are located in the middle of the periodic table are _______________.

5. The _______________ are nonmetals that do not react naturally with other elements.

What are acids and bases?

6. Litmus paper and red-cabbage juice are called _______________ because they change colors when mixed with an acid or a base.

7. The _______________ scale measures how acidic or basic something is.

8. An acid tastes _______________ and has a low pH.

9. A base tastes _______________ and has a high pH.
10. The liquid in your stomach has a pH of about 2, so it is a(n) ________________ .

11. Ammonia has a pH of about 11, which means that it is a(n) ________________ .

What are salts?
12. When an acid and a base react with each other, they form a(n) ________________ .

13. When an acid and a base are mixed, a process called ________________ produces water and a salt.

14. A salt is any compound made of positive and negative ________________ .

15. Substances that form ions when placed in water are called ________________ , and they conduct electricity.

Critical Thinking
16. A solution has a pH of 5. How will the solution taste? What would it react with to form a salt?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Chemical Properties

Match the correct letter with the description.

| a. acid | d. corrosion | g. neutralization |
| b. base | e. flammability |
| c. chemical property | f. indicator |

1. _____ describes the way a substance reacts to other substances
2. _____ reaction that occurs when an acid and a base are mixed
3. _____ chemical property of a substance that describes its ability to burn
4. _____ substance with a low pH level
5. _____ substance with a high pH level
6. _____ substance that changes colors in the presence of acids and bases
7. _____ metals combining with nonmetals
Chemical Properties

Fill in the blanks.

<table>
<thead>
<tr>
<th>acid</th>
<th>chemical</th>
<th>periodic table</th>
<th>salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>alkali</td>
<td>indicator</td>
<td>pH scale</td>
<td></td>
</tr>
<tr>
<td>base</td>
<td>noble gases</td>
<td>react</td>
<td></td>
</tr>
</tbody>
</table>

Physical properties of elements include color, density, luster, and ability to conduct heat or electricity. An element’s _______________ properties describe how it reacts with other elements. Elements are grouped on the ____________ according to similar physical and chemical properties. The elements that are most reactive are the _______________ metals. The elements that do not react naturally with other elements are the _______________.

Chemical properties of elements are determined by how they _______________ with one another when they are chemically combined. A substance that changes color in the presence of an acid or a base is a(n) _______________. The _______________ measures the strengths of acids and bases. During a neutralization reaction, a(n) _______________ and a(n) _______________ combine to produce water and a(n) _______________. Most salts dissolve easily in water.
Properties of Matter

Choose the letter of the best answer.

1. A material that cannot be broken down into simpler chemical substances is a(n)
   a. element.
   b. metal.
   c. chemical.
   d. molecule.

2. What is the smallest particle of an element?
   a. molecule
   b. proton
   c. atom
   d. metalloid

3. The positively charged particles in an atom are called
   a. neutrons.
   b. electrons.
   c. protons.
   d. molecules.

4. Which particles share the nucleus of an atom with the protons?
   a. neutrons
   b. protons
   c. elements
   d. electrons

5. Which particles in an atom are negatively charged?
   a. protons
   b. neutrons
   c. molecules
   d. electrons

6. Two or more atoms can join to form a(n)
   a. element.
   b. neutron.
   c. molecule.
   d. superatom.

7. The amount of matter in an object is its
   a. weight.
   b. mass.
   c. volume.
   d. density.
Choose the letter of the best answer.

8. The strength of gravity on an object determines that object’s
   a. mass.
   b. volume.
   c. weight.
   d. electrical charge.

9. The amount of space being taken up by matter is known as its
   a. volume.
   b. weight.
   c. mass.
   d. density.

10. When you add enough heat to a solid it will
    a. freeze.
    b. melt.
    c. condense.
    d. float.

11. The amount of mass for each milliliter of a substance determines the substance’s
    a. weight.
    b. buoyancy.
    c. density.
    d. volume.

12. An object’s resistance to sinking is called
    a. weight.
    b. buoyancy.
    c. volume.
    d. surface tension.

13. The property that allows matter to be bent, flattened, or hammered without breaking is
    a. malleability.
    b. surface tension.
    c. ductility.
    d. buoyancy.

14. What happens to a metal that is left exposed to the environment and combines chemically with a nonmetal?
    a. It shrinks.
    b. It becomes a metalloid.
    c. It corrodes.
    d. It becomes a nonmetal.

15. One of the products of the reaction between an acid and a base is a
    a. neutralization.
    b. pH scale.
    c. salt.
    d. solution.
Motion and Energy

Fill in the concept map below using the information you know about energy.

1. Motion is a change in an object’s ______________ over time.

2. Speed is a measure of how fast an object’s position changes. A measurement of an object’s speed and its direction is ______________.
   A change in an object’s velocity is ______________.

3. A force is a push or a ______________ exerted on an object.

4. Newton’s laws describe how forces affect ______________. These laws include the ______________, second, and ______________.

5. The ability to do work, or to change an object, is ______________.

6. ______________ is energy that flows between objects with different temperatures.
Motion

Use your textbook to help you fill in the blanks.

What is motion?

1. The location of an object is its ___________.
   A change in the position of an object over time is motion.
   Motion has two parts: _______________ and _______________.

2. Distance can be measured in _______________, _______________, _______________, or _______________.

3. To measure direction, you can use a(n) _______________ and units of _______________.

4. You need a(n) _______________ from which to measure position or motion.

What is speed?

5. To calculate speed, divide the _______________ by the _______________.

6. Units of speed can be _______________ or _______________.

7. The calculated speed over an entire trip is _______________ speed.

8. To state the velocity of an object, you need to know the object’s _______________ and its _______________.

Name __________________________ Date ____________

GLE 0507.II.I
What is acceleration?

9. Any change in the velocity of an object is a(n) ____________.

10. If the speed of a car traveling south is increasing 5 m/s, its acceleration is ____________.

11. An acceleration can be a change in speed or a change in ____________. Negative acceleration is called ____________.

What is momentum?

12. An object’s mass multiplied by its velocity is its ____________.

13. An object with a mass of 1 kg and a velocity of 10 m/s has a momentum of ____________.

14. The more mass an object has, the ____________ its inertia.

Critical Thinking

15. Would it be more difficult to stop a truck carrying a heavy load or stop the same truck empty? Explain your answer, using the concepts of inertia and momentum.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Motion

Use the words in the word box to finish the puzzle.

<table>
<thead>
<tr>
<th>acceleration</th>
<th>momentum</th>
<th>position</th>
<th>speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>inertia</td>
<td>motion</td>
<td>reference</td>
<td>velocity</td>
</tr>
</tbody>
</table>

**Down**
1. location of an object
3. change in velocity over time
6. the rate at which an object’s position is changing over time
7. any change in position

**Across**
2. tendency of an object to resist a change in motion
4. measurement of an object’s speed and direction of motion
5. a “frame” from which you can measure position or motion
8. mass times velocity
Motion

Fill in the blanks.

acceleration  motion  time
momentum  speed  velocity

To describe how an object moves, you need a frame of reference, or a group of objects from which you can measure position. You can then measure the object’s ________________, or change in position. By dividing the distance an object moved by the ________________ it took to move that distance, you describe an object’s average ________________. If you also measure the direction in which the object moved, you can describe its ________________. If you know an object’s speed at the beginning and end of a time interval, you can describe the object’s ________________ over that time interval.

An object’s mass multiplied by its velocity is its ________________. The greater an object’s inertia or resistance to a change in its motion, the greater its momentum.
The Positions of Earth and the Sun

Read the Reading in Science feature in your textbook.

Main Idea and Details

Use the table below to record the main idea and details described in the time line portion of the reading passage in your textbook.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aristotle developed a model showing the ____________ around _____________.</td>
<td>Many throughout history have made discoveries that help us determine how the planets and stars move.</td>
</tr>
<tr>
<td>Ptolemy used Aristotle’s model and ____________ to predict the way the Sun, the Moon, and the planets would appear in the _____________.</td>
<td>Aristotle developed a model showing the ____________ around _____________.</td>
</tr>
<tr>
<td>____________ first proposed that the Sun is at the center of the solar system.</td>
<td>Ptolemy used Aristotle’s model and ____________ to predict the way the Sun, the Moon, and the planets would appear in the _____________.</td>
</tr>
<tr>
<td>Galileo’s discovery of ____________ circling ____________ supported Copernicus’s theory.</td>
<td>____________ first proposed that the Sun is at the center of the solar system.</td>
</tr>
<tr>
<td>Einstein explained how ____________ works, helping us understand the movement of planets and stars.</td>
<td>Galileo’s discovery of ____________ circling ____________ supported Copernicus’s theory.</td>
</tr>
<tr>
<td>____________ worked on the first 3-D map of the _____________.</td>
<td>Einstein explained how ____________ works, helping us understand the movement of planets and stars.</td>
</tr>
</tbody>
</table>
Write About It

Main Idea and Details
1. Think about the selection you just read. Look for the main topic or central idea of the selection.
2. Write the main idea of the selection and give one detail that supports the main idea.

Identifying the Main Idea
The main idea is the central point of the passage. It tells you what the passage is about. Review the graphic organizer to find the main idea of the passage. Write that idea on the lines below.

Identifying Supporting Details
Details are important parts of the passage that support the main idea. Look for the supporting details within the list of scientists that follows the opening paragraphs. Give one detail from the article that supports the main idea. You can choose one supporting detail from your table.
Forces and Motion

Use your textbook to help you fill in the blanks.

What are forces?

1. Units of force are the ____________________ and the ____________________.

2. An arrow can be used to represent the ________________ and ________________ of a force.

3. Forces are pushes, pulls, or ________________ that may cause changes in motion.

4. The force that pulls any two objects together is called ________________.

What are friction and air resistance?

5. The amount of friction depends on two factors: the roughness of the ________________ of the objects and how hard the objects are ________________ together.

6. Although falling objects accelerate as they fall, the air hits them and slows them down. The ________________ of an object influences the air resistance and drag force.

What is Newton’s first law?

7. According to the law of inertia, an object at rest tends to ________________, and an object in motion tends to ________________, unless acted upon by an ________________.
What is Newton’s second law?

8. According to Newton’s second law, an object’s acceleration increases as the amount of unbalanced force on it _________________; an object’s acceleration decreases as the object’s mass _________________.

What is Newton’s third law?

9. When one object pushes on a second object, the second object pushes back on the first object with the same amount of _________________.

10. According to Newton’s third law, for every action there is a(n) _________________ but _________________ reaction.

Critical Thinking

11. Suppose that you are walking down the street. Describe the forces acting on you, and use Newton’s laws of motion to describe your motion.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Forces and Motion

What am I?

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

<table>
<thead>
<tr>
<th>a. action force</th>
<th>d. friction</th>
<th>g. reaction force</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. balanced</td>
<td>e. gravity</td>
<td>h. unbalanced</td>
</tr>
<tr>
<td>c. force</td>
<td>f. inertia</td>
<td></td>
</tr>
</tbody>
</table>

1. ______ I am the word that scientists use for a push or a pull. What am I?

2. ______ I am the force that sometimes makes sliding difficult. What am I?

3. ______ I am a force whose effect is offset by other forces, so I won’t change your motion. What type of force am I?

4. ______ I am a force whose effect is not offset, so I change your motion in some way. What type of force am I?

5. ______ I am the first force in a pair. Whatever I push pushes back on whatever caused me. What am I?

6. ______ I am the second force in a pair. If something gets pushed, I push back. What am I?

7. ______ I am the tendency of an object in motion to stay in motion.

8. ______ I am the force of attraction between two objects.
The motion of any object can be explained using the laws that Newton discovered more than 300 years ago.

His universal law of \underline{force} states that objects with more \underline{mass} have more force of \underline{gravity} between them. Objects that are separated by more \underline{distance} have less force of gravity between them.

According to Newton’s first law, also called the law of \underline{inertia}, an object at rest tends to stay at rest, and an object in motion tends to stay in motion, unless acted upon by a(n) \underline{unbalanced} force. The second law can be summed up with the equation \( F = ma \). This equation means that an object accelerates more as the size of the unbalanced \underline{acceleration} on it increases and that more massive objects \underline{inertia} less for a given force. Newton’s third law states that for every action force there is an equal and opposite reaction force.
Energy

Use your textbook to help you fill in the blanks.

What is energy?

1. Work done on an object changes the amount of ________________ that the object has.

2. Work is equal to the ________________ used multiplied by the ________________ over which the force was applied.

3. The units of work are ________________, or ________________.

4. Energy is measured in units called ________________.

5. A stretched spring has ________________ energy.

6. Lifting a ball increases its ________________ energy.

7. Chemical energy, elastic energy, and gravitational energy are different forms of ________________ energy.

What is kinetic energy?

8. Heat, electricity, sound, and light are different forms of ________________ energy.

9. The amount of kinetic energy an object has depends on the object’s ________________.
How can energy change?

10. Energy cannot be ________________ or ________________; it can only ________________.

11. Whenever energy is used to do work, energy ________________.

12. Electricity does work in an oven by moving particles around and changing into ________________.

Critical Thinking

13. Trace the energy changes that occur in a toaster, in a radio, and in a windmill used to generate electricity.

__________________________
__________________________
__________________________
__________________________
__________________________
__________________________
__________________________
__________________________
Energy

Use the words in the word box to finish the puzzle.

<table>
<thead>
<tr>
<th>chemical</th>
<th>joules</th>
<th>sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>conservation</td>
<td>kinetic</td>
<td>potential</td>
</tr>
<tr>
<td>elastic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Down
1. Energy that is stored in the position of an object is called _________ energy.
2. Units of work are _________.
3. The energy of a moving object is _________ energy.
4. The potential energy of a stretched object is called _________ potential energy.
5. The kinetic energy of particles as they move in waves is _________.

Across
6. The law of _________ of energy states that energy cannot be created or destroyed; it can only change form.
Energy

Fill in the blanks.

| destroyed | friction | positive | sound |
| elastic   | kinetic  | potential | work |

Work is defined as an unbalanced force acting on an object through a certain distance. Work will either add to or subtract from the energy of an object. The force of ____________ usually takes kinetic energy from a moving object. Energy is defined as the ability to do ____________ , or to change an object.

If you lift a ball, you give it gravitational ____________ energy. If you drop the ball, its potential energy is converted into ____________ energy.

Different forms of potential energy include chemical, nuclear, magnetic, and ____________ energy. Different forms of kinetic energy include heat, ____________ , and light. The law of conservation of energy states that energy cannot be created or ____________ . Energy can only change forms.
Heat

Use your textbook to help you fill in the blanks.

What is heat?

1. Heat is thermal energy that moves from an object with a(n) _______________ temperature to an object with a(n) _______________ temperature.

2. Heat continues to flow from one object to another object until both have the same _______________.

3. Heat is the _______________ amount of thermal energy that an object releases.

How does heat travel?

4. Conduction can occur between objects that are _______________.

5. As hot and cool portions of a liquid or gas move, _______________ currents form.

6. The heat that you can feel radiating away from hot objects as electromagnetic rays is called _______________ rays.

What is thermal conductivity?

7. Convection currents move heat more slowly than do _______________ but more quickly than conduction.

8. Heat traveling by conduction moves at the speed at which molecules can _______________ one another and change how fast nearby molecules are vibrating.
9. A material that conducts heat poorly is a good ______________.

10. Thermal conductivity increases as __________________________ increases, so ____________________ are the best conductors of heat and ____________________ are the worst conductors.

11. Objects with a low heat capacity change temperature ______________________ when heated and give off ______________________ heat as they cool.

When is heat waste?

12. Heat energy caused by friction is usually a waste product that results when energy ______________________ or ______________________.

Critical Thinking

13. Describe how heat is used in a kitchen. What appliances produce heat, and how do they produce it? What objects are used as insulators, and what objects are used as conductors?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
Heat

Who am I? What am I?

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

<table>
<thead>
<tr>
<th>a. conduction</th>
<th>d. heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. conductivity</td>
<td>e. radiation</td>
</tr>
<tr>
<td>c. convection</td>
<td>f. temperature</td>
</tr>
</tbody>
</table>

1. ______ I can transfer heat through a vacuum because I am electromagnetic rays. Who am I?
2. ______ I flow from a warmer object to a cooler object until both objects are the same temperature. What am I?
3. ______ I move heat through a material from one atom or molecule to the next. Who am I?
4. ______ I move heat as a liquid or a gas rises and sinks. Who am I?
5. ______ I am a measurement of the average thermal energy of particles. What am I?
6. ______ I can tell you how easily heat moves through a material. What am I?
Heat

Fill in the blanks.

| conduction | gases | temperature |
| convection | liquids | thermal conductors |
| faster | particles | thermal insulators |

Heat is energy that flows from an object at a higher temperature to an object at a lower temperature. The measure of the average kinetic energy of particles is _____________. When a warmer object touches a cooler object, heat moves by ______________. The particles of the warmer object vibrate ______________. The two objects stay in place, but their ______________ bump one another and energy passes from the warmer object to the cooler object.

Some materials, such as metals, are good ______________. Other materials, such as gases, are good ______________. Currents of matter spread heat through ______________ and ______________, a process called ______________. The transfer of heat by electromagnetic rays is called radiation.
Motion and Energy

Choose the letter of the best answer.

1. How fast an object’s position is changing over time is the object’s
   a. velocity.
   b. acceleration.
   c. speed.
   d. mass.

2. Momentum is calculated by multiplying an object’s mass by its
   a. mass.
   b. velocity.
   c. work.
   d. inertia.

3. The force of gravity between two objects
   a. increases with mass and decreases with distance.
   b. increases with distance and decreases with mass.
   c. decreases with mass and decreases with distance.
   d. increases with mass and increases with distance.

4. Friction between objects produces
   a. gravity.
   b. load.
   c. inertia.
   d. heat.

5. Newton’s second law of motion states that force is equal to mass times
   a. speed.
   b. energy.
   c. velocity.
   d. acceleration.

6. Placing a dish on a higher shelf increases the dish’s
   a. inertia.
   b. kinetic energy.
   c. weight.
   d. potential energy.
Choose the letter of the best answer.

7. Work is done when
   a. you push against a wall.
   b. you lift a book.
   c. you stand on the floor.
   d. you hold a box.

8. Kinetic energy is
   a. the energy of gravity.
   b. the energy of springs.
   c. the energy of motion.
   d. the energy of food.

9. The unit that is used to measure force is the
   a. meter.
   b. kilogram.
   c. Newton.
   d. joule.

10. Heat flows from a
    a. warmer object to a cooler object.
    b. warmer object to a very hot object.
    c. cooler object to a warmer object.
    d. cooler object to a very hot object.

11. The law of conservation of energy states that energy cannot be destroyed, it can only be
    a. changed
    b. created
    c. lost
    d. gained

12. How does heat move through empty space?
    a. conduction
    b. radiation
    c. convection
    d. It doesn’t.

13. Friction usually
    a. speeds up a moving object.
    b. increases with the smoothness of a surface.
    c. changes kinetic energy into heat.
    d. decreases as mass increases.
Green and Clean: Plants as Pollution Control

Read the Literature feature in your textbook.

Write About It

Response to Literature  This article describes how plants are used to help clean polluted soil. Research additional information about cleaning up waste. Write a report about the cleaning process. Include facts and details from this article and from your research.
What is technology?

Use your textbook to help you fill in the blanks.

Ways People Move

1. ________________ is more than just computers, space shuttles, and new inventions.

2. The technology of ________________ includes everything from the horse-drawn wagon to the automobile.

3. Over time, technological advances paved the way for ________________.

4. Many ________________ came about because of the technology of the automobile.

Science and Technology

5. Science and technology ________________ on each other.

6. The steam engine was invented at the beginning of the ________________.

7. ________________ knowledge helps us plan technological solutions.

Critical Thinking

Why should an inventor be concerned with using the right materials for his or her invention?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
What is technology?

Match the correct letter with the description.

<table>
<thead>
<tr>
<th>a. technology</th>
<th>e. technological solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. mass transit</td>
<td>f. design</td>
</tr>
<tr>
<td>c. industry</td>
<td>g. Industrial Revolution</td>
</tr>
<tr>
<td>d. manufacturing</td>
<td>h. maglev</td>
</tr>
</tbody>
</table>

1. A train that uses the technology of “magnetic levitation” is called a _______.
2. A business that makes goods or provides services is called an _______.
3. The way humans adapt nature to meet human needs and wants is called _______.
4. A system designed to transport large numbers of people is called _______.
5. A plan to show how something looks or functions is a _______.
6. Making products on a large scale is called _______.
7. The period of rapid development of factories and industries that began during the late 18th century is called the _______.
8. A problem that is solved by the use of technology is called a _______.
What is technology?

Fill in the blanks.

<table>
<thead>
<tr>
<th>adapt</th>
<th>science</th>
<th>design</th>
<th>techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>industries</td>
<td>technology</td>
<td>invention</td>
<td></td>
</tr>
</tbody>
</table>

______________ has been around since the beginning of human culture. Generation after generation, people ________________ and build new objects to make life easier. Technology is how humans ________________ nature to meet their needs and wants.

With new technologies, come new ________________ to support them. The ________________ of the automobile created a need for companies that built, sold, and fixed cars. Companies were needed to refine oil and sell gasoline. As more highways were built, drivers needed more places to eat and sleep while traveling.

The principles of ________________ are used to make the materials for new inventions. New technologies also help scientists and the public develop new ________________ for doing things.
Right on Track!

Write About It

Use the Internet to identify what problems mass transit systems are designed to address. Write a plan to develop or improve a system near you. Find real-life examples to help you predict how much time, materials, and money it would take. Then draw a picture, or make a model.

Getting Ideas

Think of a mass transit system near you that needs improvement.

<table>
<thead>
<tr>
<th>Mass Transit System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem: Town buses should be replaced with alternative fuel vehicles.</td>
</tr>
<tr>
<td>Research: Many cities replace traditional buses with hybrids</td>
</tr>
<tr>
<td>Solution Ideas: Raise money to buy hybrid buses</td>
</tr>
</tbody>
</table>

Planning and Organizing

Jessie writes some sample sentences for her essay. Here are some of the sentences that she wrote. Write Yes if the sentence describes a mass transit system that needs improvement. Write No if it does not.

1. The current buses burn fossil fuels and pollute the air.   
   ________

2. The current buses run through the center of town every half hour.   
   ________

3. Hybrid buses would use half the gasoline of the current bus system.   
   ________
Drafting
Write a sentence to begin your paragraph. Mention the mass transit system you will be addressing. Explain why you feel the system needs improvement.

Revising and Proofreading
Help Jessie improve her essay. Place the steps in the correct order.

1. ______ Switching to hybrid bus technology will be costly and will take several years for the town to afford.

2. ______ Mass transit systems that do not rely on fossil fuels include hybrid vehicles, and vehicles that run on biomass fuels.

3. ______ There are currently mass transit bus systems that run on hybrid technology.

Now revise and proofread your writing. Ask yourself:
- Did I write a plan to develop a mass transit system?
- Did I predict the time, materials, and money needed for the plan?
- Did I discuss the steps in the correct order?
- Did I correct all mistakes?
- Did I draw a picture or make a model?
The Design of Things

Use your textbook to help you fill in the blanks.

Improving Old Ideas

1. Today's passenger planes have built on the designs of the ____________ from the early 1900s.

2. A designer or engineer develops a ____________ solution to a problem.

The Design Process

3. Research helps designers identify a problem or a ____________.

4. A ____________ helps a designer turn an idea into a model.

5. A working ____________ will help a designer identify design problems.

Engineers and Their Work

6. Engineers use science and ____________ to design a product or process.

7. An aerospace engineer deals with ____________ such as gravity and friction.

More Is Less?

Critical Thinking What does today’s computer technology have to do with the 1947 invention of the transistor?
The Design of Things

Match the correct letter with the description.

| a. design process | e. designer |
| b. schematic | f. criteria |
| c. prototype | g. constraints |
| d. transistor | h. engineer |

1. Ways to evaluate the pros and cons of a design solution are called the ________.
2. A designer’s detailed drawing of a solution is called a ________.
3. A person who uses math and science to turn ideas into products and processes is called an ________.
4. The steps that a person goes through to find the solution to a design problem is called the ________.
5. A working model of a design is called a ________.
6. A tool invented in the 1940s that conducts electricity faster than a vacuum tube is called a ________.
7. Someone who takes an idea and designs a detailed plan to make it is called a ________.
8. Obstacles that must be overcome to make a successful design are ________.
Designers and ____________ are people who come up with technological solutions. Many technological solutions are ____________ to old designs. Airplane design has changed in the past 100 years. Today planes can fly farther and faster than ever before.

The design process starts when people have a problem that needs a ____________. A ____________ can help people identify trends or patterns. This will help the designer decide on a solution. Then the designer thinks of the ____________, or obstacles that must be overcome.

The ____________ is the part of the process that shows a detailed drawing of the plan. A ____________ can then be built from the drawing. The working model can help a designer identify the ____________ of the design.
Designing Safer Cars

Write About It

Create a survey that asks drivers what problems they have. Give it to people who drive and use their responses to come up with ideas to solve a specific need. Research the solutions to get an idea of possible constraints, such as time, money, and materials. Then draw a schematic of the best solution.

Getting Ideas

Think of problems that you have as a passenger in a car. Use some of these ideas to write your survey for drivers. Use a concept map like the one below to record your ideas.

Planning and Organizing

Carla chose to write a survey about the need for safer seat belts for children. Here are some sentences she wrote. Write Yes if the sentence relates to her chosen topic. Write No if it does not.

1. _______ Many seat belts are attached to the car too high to work well for children or shorter adults.
2. _______ Burning fossil fuels adds carbon dioxide to the atmosphere.
3. _______ A lower seat belt can improve safety for children.
Drafting

Now write a first draft essay to explain the solution you have chosen. Explain how time, money, and materials will affect your design or proposed solution. On a separate sheet of paper, include a schematic drawing of your solution.

Now revise and proofread your writing. Ask yourself:

- Have I chosen a solution that can be addressed or an object that can be designed?
- Have I discussed the possible constraints of the solution?
- Have I included a schematic drawing of my solution?
- Have I corrected all mistakes?
Technology in Communications

Use your textbook to help you fill in the blanks.

1. Talking, writing letters, using gestures, and using the phone are all forms of __________.

2. __________ allowed people to communicate quickly over long distances.

Communication Systems

3. Examples of communication __________ are cell towers, traffic signals, and phones.

4. Wireless technology systems send signals through the air using __________.

5. The parts of a system are __________, process, output, and __________.

Picture That!

6. The history of photographic technology dates back to the __________.


Critical Thinking How were the first moving pictures different from today’s films?

________________________________________________________________________

________________________________________________________________________
Technology in Communications

Match the correct letter with the description.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>communication</td>
<td>e.</td>
<td>input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>system</td>
<td>f.</td>
<td>process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>fiber optics</td>
<td>g.</td>
<td>output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Internet</td>
<td>h.</td>
<td>feedback</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. A newer kind of hardware that sends signals by light is called ________.
2. A huge system of computers and files shared by people all over the world is called the ________.
3. A group of separate parts that work together to do something is called a ________.
4. The exchange of ideas and information is called ________.
5. The information that is put into a system is called the ________.
6. The way information is sent through a technological system is called the ________.
7. The information that is received in a technological system is called the ________.
8. A return signal sent as a result of a system output is called ________.
Fill in the blanks.

<table>
<thead>
<tr>
<th>cell</th>
<th>film</th>
<th>process</th>
<th>telegraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>digital</td>
<td>input</td>
<td>system</td>
<td>telephone</td>
</tr>
</tbody>
</table>

Communication is faster and easier today than it was long ago. Electricity allowed for the invention of many other technologies. The __________ machine used Morse code to send messages with electricity. Then the __________ allowed people to talk to people across the country. With improvements to technology, people can now talk on __________ phones using wireless technology.

A technological __________ is a group of separate parts that work together to do something. When sending a signal through a system, the __________ is the first stage. The way the message is transmitted is called the __________.

Photography and film has changed over the years also. For many years, cameras used light-sensitive __________ to capture images. Today, __________ photography allows us to see our images immediately.
What’s on TV?

Write About It

Research more about the history of the television. Write a report using the details you find in your research. Then make a time line to identify how television has impacted society at various times.

Getting Ideas

Think about the most important events in TV history. Make a time line and then use the information to write your report. Record the information for your time line on a chart like the one below.

<table>
<thead>
<tr>
<th>Time Line of Television History</th>
</tr>
</thead>
<tbody>
<tr>
<td>1887: Thomas Edison invents motion picture camera.</td>
</tr>
<tr>
<td>1907: Cathode ray tube makes first TV images.</td>
</tr>
<tr>
<td>1936: First television broadcast made in London.</td>
</tr>
<tr>
<td>1946: Television networks begin in the United States.</td>
</tr>
<tr>
<td>1965: Color television is broadcast for first time.</td>
</tr>
<tr>
<td>1969: Moon landing shown live on TV.</td>
</tr>
<tr>
<td>2005: Flat screen TVs and HDTV become popular.</td>
</tr>
</tbody>
</table>

Planning and Organizing

Miguel writes some sample sentences for his report. Here are some of the sentences that he wrote. Write Yes if the sentence relates to the history of television. Write No if it does not.

1. Millions of Americans witnessed the Moon landing live on television, and the experience brought the country together. _______
2. People were amazed at the technology of television in the 1940s. _______
3. In the future, television may be broadcast over the Internet. _______
Drafting

Write a sentence to begin your report. Tell what the topic of your report is.

Revising and Proofreading

Help Miguel improve his essay. Place the steps in the correct order.

1. _______ Color television was first broadcast on the NBC network.

2. _______ HDTV has greater resolution than tube televisions that came before them.

3. _______ The technology of television was made possible by the motion picture camera and the cathode ray tube.

Now revise and proofread your writing. Ask yourself:

- Did I list events in the history of television that have impacted society?
- Did I discuss the events in the correct order?
- Did I make a time line of the events in television history?
- Did I correct all mistakes?
Technology in Medicine

Use your textbook to help you fill in the blanks.

Modern Medicine

1. Long ago, pharmacists used plant parts to make _________________.
2. Today, vaccines can keep people healthy. They use weakened _________________ to help the body build a defense against a disease.

Modern Medical Techniques

3. Medical advances have helped people live _________________ and healthier lives
4. Doctor’s may use a camera called an _________________ to look inside a patient’s body.
5. Lasers are often used by doctors who perform _________________.

Into the Twenty-First Century

6. Doctors use _________________ to move robotic arms and hands which use surgical instruments.

Getting Down to Genes

7. Scientists use genetic engineering to control the characteristics of some _________________.

Bio-basics for Solutions

8. One example of _________________ is genetic engineering.

Critical Thinking What is a positive and a negative effect of using biological pesticides?

__________________________________________________________________________

__________________________________________________________________________
Technology in Medicine

Match the correct letter with the description.

<table>
<thead>
<tr>
<th>a. pharmacists</th>
<th>e. traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. vaccine</td>
<td>f. genetic engineering</td>
</tr>
<tr>
<td>c. laser</td>
<td>g. biotechnology</td>
</tr>
<tr>
<td>d. genetics</td>
<td>h. prosthesis</td>
</tr>
</tbody>
</table>

1. A tool that focuses intense light waves that travel in a straight line is called a ________.
2. A weakened microorganism, or germ, put into a person’s body is called a ________.
3. The use of living things to make products that improve the quality of life is called ________.
4. The study of how traits are passed in genes from one generation to the next is called ________.
5. People who prepare and give out medicine are called ________.
6. Characteristics of living things are called ________.
7. An artificial limb is called a ________.
8. Technology that allows scientists to work with genes to control characteristics is called ________.
Technology in Medicine

Fill in the blanks.

<table>
<thead>
<tr>
<th>electricity</th>
<th>medicine</th>
<th>pharmacist</th>
<th>vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>electrocardiogram</td>
<td>pacemaker</td>
<td>sanitation</td>
<td></td>
</tr>
</tbody>
</table>

Long ago, people used herbs and vegetables as a kind of ___________. Even in ancient times, people had their medicines made by a ___________. In the 1800s, diseases spread quickly because people lived in cities with poor ___________ and crowded conditions. Then, the invention of the ___________ allowed people to avoid getting some illnesses in the first place.

Today people live longer lives because of medical technology. An EKG, or ___________, is a machine that can sense problems with the heart. A ___________ is a device that can be put in the body to send an electric pulse to make a person’s heart contract, or beat. Many of today’s most important technologies rely on ___________.
Spare Body Parts

Write About It

Research some more information about prosthetic limbs. Write a report about how technology is improving the lives of people with prosthetics. Include specific examples, and detail what materials are being used.

Getting Ideas

Think of problems that you have as a passenger in a car. Use some of these ideas to write your survey for drivers. Use a concept map like the one below to record your ideas.

Planning and Organizing

Carla began her report about the technology behind new prosthetics. Here are some sentences she wrote. Write Yes if the sentence relates directly to her chosen topic. Write No if it does not.

1. _______ A microprocessor helps the newest prosthetic devices to function properly.
2. _______ It is important to consider how a new technology will affect people.
3. _______ Lightweight materials allow patients to do more than ever before with their prosthesis.
Drafting

Now write a first draft of your report. Explain how new technologies have allowed for improvements in prosthetics. Discuss specific examples and talk about the materials used.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Now revise and proofread your writing. Ask yourself:

▶ Have I discussed modern improvements in prosthetics?
▶ Have I talked about the newest materials used?
▶ Have I given real examples based on research?
▶ Have I corrected all mistakes in grammar, punctuation, and capitalization?
Exploring the Impact of Technology on Society

Use your textbook to help you fill in the blanks.

Using Technology Responsibly
1. Technology in our society has both a positive and negative _________.
2. Cars are a convenient technological travel solution. However, a trade-off is the traffic and _________. cars cause.
3. Governments help to set up ethics for technology by passing _________.

It’s Not Easy!
4. People do not always agree on what is _________ when it comes to technological solutions.

Similar Systems, Different Technologies
5. In Ancient Rome, ________ were built to bring water to the city.
6. The idea of carrying water long distances to a city was used for modern-day _________.
7. Today, large ________ are used to bring water from reservoirs to cities for use.

Critical Thinking Use a two-column chart to list the similarities and differences between between the ancient Roman and modern New York systems for delivering water.

<table>
<thead>
<tr>
<th>Rome</th>
<th>New York City</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exploring the Impact of Technology on Society

Match the correct letter with the description.

- a. impact
- b. trade-off
- c. ethics
- d. aqueducts
- e. risk
- f. benefit
- g. tracking
- h. reservoir

1. Long channels that carried water from one place to another were called _______.
2. Something you have to give up to get what you want is called a _______.
3. Rules that people follow so that they behave responsibly are called _______.
4. A large area used as a water supply is a _______.
5. The effect something has on other things is called an _______.
6. The action of following the trail of someone or something is called _______.
7. Another word for a danger is a _______.
8. An advantage that we get from something is called a _______.

Name ____________________________ Date __________
Exploring the Impact of Technology on Society

Fill in the blanks.

aqueducts  ethics  pollution  trade-off
decisions  negative  solution  tunnels

Technology improves the way we live. However, technology can also have a ___________ impact on society. A ___________ is something you have to give up to get what you want. For example, trash collection helps keeps our towns clean. It also adds ___________ to landfills.

When thinking of a technological ___________ , we must consider its impact on the way we live.

It is important to use ___________ when using technology. Sometimes laws tell us how we can and cannot use technology. Other times, individuals and companies must make their own ___________.

Some technological systems are built on older ideas. Think about the ___________ that bring water from reservoirs in upstate New York to the city for use as drinking water. This idea is based on the ___________ in Ancient Rome.
Write About It

Do some research about satellites and how they work. How are they part of a system? What other uses do they have for society? What about their trade-offs? Write a compare and contrast report of your findings in which you evaluate the good and the bad. Do you think satellites are worth the trade-offs?

Getting Ideas

All technologies have some kind of trade-off. What are the positive and negative effects of satellites? Compare and contrast them in a chart like the one below.

<table>
<thead>
<tr>
<th>Positive Effects</th>
<th>Negative Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help track endangered species.</td>
<td>Relaying information is complex.</td>
</tr>
<tr>
<td>Can broadcast communications around the world.</td>
<td>Expensive to build and launch.</td>
</tr>
<tr>
<td>Can keep people safe by observing weather patterns from space.</td>
<td>Difficult to repair in space.</td>
</tr>
</tbody>
</table>

Planning and Organizing

Evan began his report about the positive and negative effects of satellites. Here are some sentences he wrote. Write Yes if the sentence contains words and details that create a clear picture for the reader. Write No if it does not.

1. _______ Satellites can have good and bad effects.

2. _______ Satellites allow us to transmit messages and important information through space and around the world in an instant.

3. _______ Satellites use a complex and expensive system to gather and broadcast information.
Drafting

Write a sentence to begin your report. Tell what your topic is. Explain that you will discuss the positive and negative effects of technology on society.

Now write your description. Use a separate sheet of paper. Begin with the sentence you wrote above. Tell what some of the impacts and trade-offs of satellites are. Include descriptive words and details to help the reader visualize what you are writing.

Revising and Proofreading

Here are three sentences that Evan wrote for his report. Help him improve them. Replace each italic word or words with a more descriptive word from the box. Write the word in the blank.

<table>
<thead>
<tr>
<th>millions of</th>
<th>transmit</th>
<th>depend on</th>
</tr>
</thead>
</table>

1. ____________ A satellite system is an expensive way to send information.

2. ____________ Meteorologists use satellite technology every day.

3. ____________ Many people use information gathered by satellites.

Now revise and proofread your writing. Ask yourself:

- Did I discuss the benefits and trade-offs of satellites?
- Did I use words that create a clear picture for the reader?
- Did I use descriptive words to discuss the topic?
- Did I correct all mistakes in grammar, spelling, punctuation, and capitalization?