Reinforcement & Vocabulary Review Worksheets

To jump to a location in this book

1. Click a bookmark on the left.

To print a part of the book

1. Click the Print button.

2. When the Print window opens, type in a range of pages to print.

   The page numbers are displayed in the bar at the bottom of the document. In the example below, “1 of 151” means that the current page is page 1 in a file of 151 pages.
Complete this worksheet after you finish reading Chapter 1, Section 1. Read the scenes below, and explain what kind of Earth scientist is described. Write your answers in the space provided. Be as specific as possible.

<table>
<thead>
<tr>
<th>Scene 1</th>
<th>Scene 2</th>
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<tbody>
<tr>
<td>In the desert of New Mexico, a young woman observes the stars every night and makes star charts. She notices a speck of light in the “Square Constellation” that she has never noticed before.</td>
<td>A university professor is at Point Reyes National Seashore, in California, measuring the depth of the tidal pools. As the day grows later, the tidal pools get deeper.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Scene 3</th>
<th>Scene 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is winter in Michigan. A young man in Kalamazoo is looking at a satellite weather map. He predicts snow flurries across southern Michigan for the next 2 days.</td>
<td>It is a cloudy day in the state of Washington. An experienced scientist is observing Lava Canyon, on the volcano Mount St. Helens. She notices that all the trees on the canyon floor are missing limbs near their bases.</td>
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</table>

Which of the four areas of Earth science represented in these scenes is most interesting to you? Why?

<p>| |</p>
<table>
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</table>
After finishing Chapter 1, give this puzzle a try!

**ACROSS**
1. The study of the atmosphere
4. The study of the surface features of the Earth
6. The study of the ocean
7. The study of all physical things beyond the planet Earth
9. ______ warming is a worldwide increase in temperature.
13. Combines geology and chemistry
15. The amount of space that something occupies
17. A unifying explanation for a broad range of hypotheses and observations supported by testing
18. The study of maps of the surface features of the Earth
19. Volume is often given in this unit.

**DOWN**
2. The study of the solid Earth
3. The basic SI unit of mass
5. A possible explanation or answer to a question
8. Scientists use the scientific ______ to answer questions.
10. A representation of an object or system
11. The special area of question 6 across that deals with waves and currents
12. The study of ecosystems
14. The basic SI unit of length
16. The amount of matter that something is made of
Complete this worksheet after you finish reading Chapter 2, Section 1.

1. a. Name three cities shown on the map that have about the same latitude, and give the latitude.

________________________________________

b. Estimate the longitude of the three cities you named in part a.

________________________________________

________________________________________

2. a. Name three cities shown on the map that have about the same longitude, and give the longitude.

________________________________________

b. Estimate the latitude of the three cities you named in part (a).

________________________________________

________________________________________

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Imagine you are taking a hike through a national park. The park ranger gives you a topographic map to help you find your way. Use the map below to answer the following questions.

1. At what end of the park is the ranger’s station?
   a. northwest  
   b. southwest  
   c. southeast  
   d. northeast

2. How many trees are in the park? __________

3. At what elevation is the ranger’s station? __________

4. At what elevation is the bridge? __________

5. How many cabins are at or above an elevation of 750 m? __________

6. How high is the highest point in the park? __________

7. What is in the northwest corner of the park?
   a. a mountain  
   b. a depression  
   c. a lake  
   d. a hill

8. How long is the path that takes you from the ranger’s station to the lake? __________

9. What is the contour interval of this map? __________

10. The river has eroded away some of the soil. What feature of the topographic map indicates this? __________
After finishing Chapter 2, give this puzzle a try!

Below is a treasure map. By choosing the correct answers and following the directions that correspond to those answers, you should find the treasure.

In order to keep track of where you are going, circle each correct answer. Start at the place labeled “Home” on the treasure map. Each line on the grid represents 10° longitude or latitude. Mark your path in pencil in case you make a mistake and need to start over.

1. a way to find the variation from true north
   Follow the arrow on a compass. (Go 20° north.)
   Factor in the magnetic declination. (Go 10° east.)

2. the geographic North Pole
   true north
   (Go 30° north.)
   magnetic north
   (Go 10° south.)
3. can be used to compare elevations
   cardinal directions contour lines
   (Go 20° east.) (Go 30° west.)

4. 0° longitude
   prime meridian equator
   (Go 30° north.) (Go 20° east.)

5. gathering information without anyone being there
   remote sensing azimuthal projection
   (Go 10° east.) (Go 20° south.)

6. the difference in elevation between one contour line and another
   contour interval contour index
   (Go 10° south.) (Go 10° west.)

7. a projection map that has parallel lines of longitude and latitude
   conic Mercator
   (Go 30° south.) (Go 20° east.)

8. lines that go through the poles
   latitude longitude
   (Go 10° west.) (Go 10° south.)

9. the height of an object above sea level
   elevation relief
   (Go 20° east.) (Go 20° north.)

Where is the treasure?
Complete this worksheet after you finish reading Chapter 3, Section 2. Use Sections 1 and 2 of the text and the clues given below to name each mineral.

Clues: silicate
- makes up about half of Earth’s crust
- pinkish crystals in granite
Name: ________________

Clues: nonsilicate
- contains sodium and chlorine
- breaks at 90° angles in three directions
Name: ________________

Clues: contains oxygen and carbon
- softer than fluorite but harder than gypsum
- effervesces when it contacts an acid
Name: ________________

Clues: contains oxygen and silicon
- shiny and soft
- separates easily into sheets
Name: ________________

Clues: contains fluorine
- nonsilicate
- glows under ultraviolet light
Name: ________________

Clues: nonsilicate
- native element
- has a specific gravity of 19
Name: ________________
**The Mineral Quiz Show**

Complete this worksheet after you finish reading Chapter 3, Section 2.

**Announcer Don Fargo:** It's time to play your favorite quiz game—The Mineral Quiz! Now here's your host, Hackly Halite! Take it away, Hackly. . . (Applause)

**Hackly:** Thank you very much everyone. Let's begin!!! Our first category is “Luster.”

For 100 points, luster is the way the surface of a mineral reflects __________________. For a bonus of 50 points, fill in the blank: A vitreous luster is ________________. (metallic or nonmetallic)

**Don:** Now it's time for a word from our sponsors, Inorganic Crystals. Remember, minerals have a repeating inner structure!

**Hackly:** Hey, we're back! Our new category is “Cleavage.”

For 100 points, cleavage is the tendency of some minerals to break along __________________________ surfaces. For a 50-point bonus, describe the cleavage of a diamond.

__________________________

__________________________

I think we have time for one more category—“Hardness”!

For 100 points, __________________________ is the softest reference mineral on the Mohs' hardness scale.

For a 50-point bonus, what is the hardest reference mineral on the Mohs' scale? __________________________

(Buzzer sounds)

**Don:** You know what that means! It's time to play the Bonus Round! Each question is worth 75 points.

**Hackly:** Fill in the blanks below for bonus points!

All silicate minerals contain __________________________ and __________________________.

Conchoidal is a type of __________________________.

__________________________ is more reliable than color as an indicator of a mineral's identity.

**Hackly:** Well, that's all the time we have for today. Thanks so much for playing The Mineral Quiz! (Applause)
After you finish Chapter 3, give this puzzle a try!
For each of the clues below, fill in the letters of the word or phrase being described in the blanks provided on the next page.

1. inorganic solid with a crystalline structure found in nature
2. shiny luster
3. the way a surface reflects light
4. the tendency of minerals to break unevenly
5. Mohs’ scale measures ________.
6. the smallest part of an element that has all the properties of the element
7. substances that cannot be broken down by chemical means
8. the tendency of a mineral to break along flat surfaces
9. type of mineral that contains oxygen and silicon
10. the amount of matter in a given space
11. solid, geometric forms of minerals produced by a repeating pattern of atoms
12. color of the powdered form of a mineral
13. returning the land to its original state after mining
14. a mineral deposit large enough and pure enough to be mined for a profit
15. halides, oxides, sulfates, sulfides, carbonates, and native elements are ________ minerals.
16. helps conserve nonrenewable resources by reducing our need for minerals
17. nonsilicate minerals containing sulfur and oxygen
18. Minerals that look like plastic have a ________ luster.
19. a substance made of two or more elements that have been chemically joined
20. Minerals can form in these small teardrop-shaped formations.
21. Specific ________ is the ratio of an object’s density to that of water.
22. a cubelike class of crystals
23. not a reliable indicator of a mineral’s identity because it can be changed by weathering
24. type of mining in which shafts and tunnels are dug underground to reach the ore
Digging Deeper, continued

1. __ __ __ __ __ A __
2. __ __ __ __ L __ __ __
3. L __ __ __ __ __
4. __ __ __ __ T __ __ __
5. H __ __ __ __ __ __ __
6. A __ __ __
7. __ __ __ __ __ __

8. __ __ __ __ __ __ G __

9. __ __ __ __ __ L __ __ __ __ __
10. __ __ __ __ __ I __ __ __
11. __ __ __ __ __ T __ __ __
12. __ _ T __ __ __ __ __
13. __ _ E __ __ __ __ __ __ __ __ __
14. __ _ R __
15. __ _ S __ __ __ __ __ __ __

16. __ __ __ __ __ __ I __ __ __
17. S __ __ __ __ __ __ __

18. __ __ __ __ __ N __ __ __
19. __ __ __ __ __ O __ __ __
20. __ __ __ __ __ __ __ __ __ T __ __

21. G __ __ __ __ __ __ __ __ __
22. __ __ __ O __ __ __ __ __ __ __
23. __ __ __ L __ __ __
24. D __ __ __
REINFORCEMENT WORKSHEET

What Is It?

Complete this worksheet after you finish reading Chapter 4, Section 4.

In the boxes on the left, identify the rock being described as sedimentary, igneous, or metamorphic. Then in the boxes on the right, write the appropriate description in the blanks provided.

It can be distinguished by its layers.
It comes in two main categories, clastic and chemical.
Its origin is layers of sediment.
What is it?

Fill in the blanks below with clastic or chemical.

____________________ rocks are formed when rock or mineral fragments stick together.
____________________ rocks are formed from solutions of minerals and water.

It is a result of change in the structure, texture, or composition of a rock.
It comes in two textures, foliated and nonfoliated.
Its origin is intense heat and pressure.
What is it?

Fill in the blanks below with foliated or nonfoliated.

In __________________ rock, the mineral grains are aligned, but in __________________ rock, they are not aligned.

Write a riddle like those above for the third kind of rock.

What kind of rocks are formed when the magma cools on Earth’s surface?

What kind of rocks are formed when the magma cools beneath Earth’s surface?
After finishing Chapter 4, give this game a try!
This game is for two people, X and O. A third person should serve as the referee.

Definitions:
A. The makeup of a rock, usually according to the minerals present in it
B. Igneous rock that forms when lava cools and solidifies on the Earth’s surface
C. The texture of metamorphic rock in which mineral grains are aligned
D. Rock that forms when magma or lava cools and solidifies
E. Igneous rock that forms when magma cools and solidifies beneath the Earth’s surface
F. A solid mixture of crystals of one or more minerals
G. Hot liquid that forms when rock partially or completely melts
H. Rock that forms when the texture and composition of a preexisting rock change due to heat or pressure
I. The texture of metamorphic rock in which mineral grains show no alignment
J. The process by which one rock type changes into another rock type
K. Rock that forms when sediments are pressed and cemented together
L. The layering of sedimentary rock
M. The sizes, shapes, and arrangement of particles or grains that make up a rock
N. Hot liquid that erupts onto the Earth’s surface
O. Long cracks in the Earth’s surface
P. The layers of sedimentary rock

Rules
1. Choose who goes first.
2. Pick a square below, and find the definition in the list to the left that matches the word in the square. The referee will check to see if you picked the correct definition.
3. If the definition is correct, mark the square with your letter.
4. Your opponent chooses another square and finds its definition.
5. Continue playing until one player has four X’s or O’s in a row horizontally, vertically, or diagonally.

<table>
<thead>
<tr>
<th>Rock cycle</th>
<th>Extrusive rock</th>
<th>Magma</th>
<th>Fissures</th>
</tr>
</thead>
<tbody>
<tr>
<td>_________</td>
<td>_______</td>
<td>______</td>
<td>_________</td>
</tr>
<tr>
<td>Composition</td>
<td>Igneous rock</td>
<td>Sedimentary rock</td>
<td>Nonfoliated</td>
</tr>
<tr>
<td>_______</td>
<td>_______</td>
<td>______</td>
<td>_________</td>
</tr>
<tr>
<td>Intrusive rock</td>
<td>Stratification</td>
<td>Texture</td>
<td>Rock</td>
</tr>
<tr>
<td>_______</td>
<td>_______</td>
<td>______</td>
<td>_________</td>
</tr>
<tr>
<td>Foliated</td>
<td>Lava</td>
<td>Metamorphic rock</td>
<td>Strata</td>
</tr>
<tr>
<td>_______</td>
<td>_______</td>
<td>______</td>
<td>_________</td>
</tr>
</tbody>
</table>
Complete this worksheet after you finish reading Chapter 5, Section 1.

Something that people use that comes from the Earth is known as a natural resource. There are a lot of natural resources on the Earth, and they are broken up into two types—renewable and nonrenewable. You might be wondering what the difference is between these two. The difference has to do with how long it takes to replace the resource. Renewable resources, such as trees, can be replaced in a relatively short time after they are used. But a nonrenewable resource, such as coal, can take thousands or millions of years to replace. Because it takes such a long time to replace nonrenewable resources, whatever amount exists on Earth right now is limited.

Take a look at the pictures below, and label each item with an R if it is renewable or with an N if it is nonrenewable. Write your answer on the line provided.
If It's a Fossil, How Is It a Fuel?

Complete this worksheet after you finish reading Chapter 5, Section 2.

Millions of years ago the fossil remains of once-living organisms were buried deep in the Earth. These fossils are what give us fossil fuels. Fossil fuels are nonrenewable energy resources that come in three forms—solid, liquid, and gas. Using the terms listed below, fill in the diagram that follows. Terms may be used more than once.

- solid
- liquid
- decayed swamp plants
- gas
- petroleum
- decayed sea life
- butane
- a rock
- coal
- kerosene
- natural gas
After finishing Chapter 5, give this puzzle a try!

In each of the following items, use the clue to unscramble the letters, and write the term in the corresponding blanks.

1. fuel made from gasoline and alcohol: HOSLGOA

2. produced when sunlight acts on automobile exhaust: OGMS

3. an example of this is using old newspapers to make the paper for new newspapers: YIERCGLCN

4. the only fossil fuel that is a rock: ALOC

5. energy from the sun: LSOAR   EERNGY

6. examples are trees and fresh water: BAREEENLW   OEECSRUR

7. the method used to extract shallow deposits of coal from the Earth: STPRI   INMGIN

8. created because the sun heats air unevenly: NWDI   GYREEN

9. rain or snow that contains a high amount of sulfuric acid: ADCI   REIPNTITCIAPO

10. examples are oil and natural gas: BELWENNEARON   SEORCUERS

11. created by falling water: DECHOLRIETYRC   NREGEY
12. a natural resource that people use to make energy: GREENY EEROCSR

13. the term for organic matter that contains stored energy: OSMISA

14. formed from once-living organisms whose remains were buried: ISLSFO SUFEL

15. used to generate electricity or for heating: UATLNAR AGS

16. comes from the nuclei of atoms: NCLUAER EYEGNR

17. an organism, energy form, or natural substance used by living things: TANLUAAR CSORUREE

18. substance that gasoline, jet fuel, and diesel fuel are made from: TPEUROMEL

19. produced by heat below the Earth’s surface: EHRELGMOT YENGRE

Now, go back through items 1–19. Group the numbered letters together by number, and unscramble each group to make a word. Then, write the unscrambled word for each group in the corresponding boxes to form a statement about our use of natural resources.
Complete this worksheet after you finish reading Chapter 6, Section 1.

Use the following terms to label the diagram below. Then use the terms to fill in the blanks in the sentences that follow. Terms may be used more than once.

- crust
- outer core
- mantle
- inner core
- mesosphere
- asthenosphere
- tectonic plate

What Am I?
I am part of the lithosphere, but I move around on top of the asthenosphere. I am a(n) ____________________.

Where Are We?
We journeyed to the center of the Earth, and when we got there we discovered that the core has two parts! One part is liquid and is called the ____________________. The other part is dense and solid and is called the ____________________. 
A Moving Jigsaw Puzzle

Complete this worksheet after you finish reading Chapter 6, Section 3.
The theory of plate tectonics explains that the Earth’s lithosphere is divided into tectonic plates. These tectonic plates move in relation to one another. An area where two plates meet is called a boundary. There are three types of boundaries, and each defines the type of motion that takes place when two plates meet. Using the following hints, label each diagram with the kind of boundary being shown.

Types of Boundaries

**Convergent:** This word is the adjectival form of the word converge. To understand the meaning of this word, pretend you and a friend are on opposite sides of a room and you both walk toward a chair that is at the center of the room. When you meet each other at the chair, you have converged on the chair. In other words, you have come together so that you meet at the same place.

**Divergent:** This word comes from the word diverge, which means the exact opposite of the word converge. In this case, you and your friend stand back to back at the center of the room and walk away from each other.

**Transform:** This word means “to change the form or appearance of something.” It does not specify how the change occurs; it just tells that a change is taking place.

---

1. [Diagram]
2. [Diagram]
3. [Diagram]
After finishing Chapter 6, give this puzzle a try!
Use the clues to help you unscramble the words given. Write your answer in the spaces provided.

1. the tectonic process that takes place along mid-ocean ridges: AES RFOOL REGIDANSP
   __ __ __ __ __ __ __ __ __ __ __
   __ __ __ __ __ __ __ __ __ __ __

2. the breaking and sliding surface between blocks of crust: LFUTA
   __ __ __ __ __ __ __ __ __ __ __

3. the strong, lower part of item 17: OEEEMPShR
   __ __ __ __ __ __ __ __ __ __ __

4. the place where two tectonic plates push into one another: VNONTRGECE NBURAYOD
   __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
   __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

5. the layer of Earth that is made mostly of iron: RCEO
   __ __ __ __ __ __ __ __ __ __ __

6. term that describes the bending of rock layers due to stress: IFLGNOD
   __ __ __ __ __ __ __ __ __ __ __

7. the solid, dense center of the Earth: NNERI CREO
   __ __ __ __ __ __ __ __ __ __ __

8. the place where two tectonic plates move away from one another: EIREVNDGT YUNADBRO
   __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
   __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

9. occurs when the hanging wall moves up relative to the footwall: EEVRERS UTLFA
   __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
   __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

10. the layer of solid rock that flows very slowly: SEEONHTAPSRHE
    __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

11. a theory that says the lithosphere is divided into plates that move around on top of the asthenosphere: ATPLE ICESTNOTC
    __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
Earthly Anagrams, continued

12. the type of stress that occurs when two of item 23 collide: ONOSERCISMP
   — — — — — — — — — — — — — — — — — —

13. the layer of the Earth made up of items 21 and 17: LHETPHESROI
   — — — — — — — — — — — — — — — — — —

14. a region where oceanic plates sink down into the asthenosphere:
   SOUITNDCBU NEZO
   — — — — — — — — — — — — — — — — — —

15. the liquid layer of the Earth beneath item 17: ROUTE ECRO
   — — — — — — — — — — — — — — — — — —

16. occurs when the hanging wall moves down relative to the footwall:
    AORNLM LAUFT
   — — — — — — — — — — — — — — — — — —

17. the layer of Earth that has the most mass: METNAL
   — — — — — — — — — — — — — — — — — —

18. occurs when opposing forces cause rock to break and move horizontally:
    SETKIR IPLS ATULF
   — — — — — — — — — — — — — — — — — —

19. the theory that continents move apart from each other: TCOITAENLNN FDTRI
   — — — — — — — — — — — — — — — — — —

20. type of stress in a stretched rubber band: TSENNIO
    — — — — — — — — — — — — — — — — — —

21. the layer of Earth on which we live: RCSUT
    — — — — — — — — — — — — — — — — — —

22. the place where two tectonic plates slide past each other horizontally:
    AFRMTONSR YNUDRBOA
   — — — — — — — — — — — — — — — — — —

23. pieces of the “rock sphere”: ENCCTITO TPSAEL
   — — — — — — — — — — — — — — — — — —

24. the amount of force per unit area put on a given material: TSRSES
   — — — — — — — — — — — — — — — — — —
Complete this worksheet after you finish reading Chapter 7, Section 2.

Imagine that you are an editor for a newspaper and are about to edit an article that must go to press tonight. You got the article just minutes before the reporter left for the airport to begin his 2-week vacation. Yet, now that you are finally sitting down to edit the article, you notice that there are important bits and pieces missing from the first two paragraphs! Using the list of words that are given below, fill in all the missing bits of information so the article can be included in tomorrow morning's edition. Some words may be used more than once. Good luck!

**Spotlight on a Scientist**

This week we’ll be visiting with a [molly goodman]. Molly Goodman is right here in our hometown. Molly said that a break in the Earth’s crust, called a [fault], got her interested in the field of [seismology]. She was fascinated when she learned that a [seismogram] is the result of tectonic plates in the Earth’s crust moving in different directions. As the plates move, they cause [elastic deformation], which is a change in the shape of rocks due to stress. Because the rock deforms like a piece of molded clay during [plastic deformation], only [elastic rebound], in which the rock behaves like a breaking rubber band, leads to earthquakes.

One of the most important pieces of equipment Molly uses every day is an earthquake-sensing instrument called a [seismograph], which records seismic waves. These waves are a type of energy that moves through the Earth. They are caused when rocks in the tectonic plates are deformed and spring back to their original shape. This is called [elastic rebound]. The seismograph traces the movement of these waves in a line called a [seismogram]. A [seismologist] uses these lines to find the [epicenter] of an earthquake. The [epicenter] is the point on the Earth’s surface right above the starting point of an earthquake. Just beneath this point is the [focus]. The [focus] is the area inside the Earth where the earthquake begins.

**Vocabulary**

- seismograph
- epicenter
- seismology
- seismologist
- elastic deformation
- elastic rebound
- focus
- plastic deformation
- fault
- seismogram
- deformation
Got the Shakes?

After finishing Chapter 7, give this puzzle a try!

**ACROSS**

3. break in the Earth’s crust along which portions of the Earth’s crust move relative to one another

4. the study of earthquakes

5. point inside the Earth where an earthquake begins

8. point on Earth’s surface directly above an earthquake’s starting point

11. the fastest seismic waves

13. secondary seismic waves

14. Sections of active faults that have had few earthquakes are likely to be sites of strong earthquakes.

15. a tracing of earthquake motion

**DOWN**

1. change in shape of rock due to stress

2. sudden return of elastically deformed rock to an undeformed shape

6. waves of energy that travel through Earth

7. instrument that records seismic waves

9. area where no direct seismic waves from a particular earthquake can be detected

10. areas along a fault where relatively few earthquakes have occurred

12. place within the Earth where the speed of seismic waves increases sharply

15. a tracing of earthquake motion
Complete this worksheet after you finish reading Chapter 8, Section 2.

Volcanoes form due to a buildup of rock around a vent. Each of the boxes below represents one of the three types of volcanoes—shield, cinder cone, and composite. Determine which type of volcano is being described by the notes at left and write the note in the appropriate box.

- also known as stratovolcanoes
- built entirely out of pyroclastic material
- sides have a gentle slope
- often found in clusters
- have broad bases and summits with steep sides
- have only nonexplosive eruptions
- built entirely out of runny lava
- erode very quickly
- formed by explosive eruptions that are followed by lava outpourings

<table>
<thead>
<tr>
<th>Composite volcano</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Shield volcano</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cinder cone volcano</th>
</tr>
</thead>
</table>
Complete this worksheet after you have finished reading Chapter 8, Section 3.

1. Two simple models of tectonic plates are shown below. Each rectangle represents a tectonic plate. Draw a sketch below each model that shows how the two plates will look after they have moved over a period of time. Be sure to indicate where the magma forms.

   **Divergent boundary**
   ![Divergent boundary diagram]
   
   **Convergent boundary**
   ![Convergent boundary diagram]

2. Briefly explain why there is usually volcanic activity when the two plates move at a divergent boundary.

   
   
   

3. Explain why there is usually volcanic activity when the two plates move at a convergent boundary.

   
   
   
   
   
   

Complete this puzzle after you finish Chapter 8.
Use the hints below to fill in the missing letters in the volcano puzzle on the next page. All of the words are spelled horizontally.

1. Magma that erupts and flows onto the Earth’s surface
2. A deep crack formed by diverging tectonic plates
3. A hole in the Earth’s crust
4. Hot liquid that forms when rock melts
5. A funnel-shaped pit around the central vent of a volcano
6. Small volcanic cones made entirely of pyroclastic material
7. A volcano built out of layers of lava from repeated nonexplosive eruptions
9. Formed when a magma chamber empties and its roof collapses
10. One or more vents and the lava or pyroclastic material that they have spewed onto the Earth’s surface
11. A stratovolcano
12. ________ material consists of erupted magma that solidifies as it travels through the air.
Fill In the Volcano, continued

1. L
2. I
3. N
4. M
5. R
6. C
7. S
8. S
9. A
10. V
11. C
12. P

Answer:

1. L
2. I
3. N
4. M
5. R
6. C
7. S
8. S
9. A
10. V
11. C
12. P
Beneath the description, write the process that is taking place. (conduction, convection, or radiation)

1. One heater located in the deep end warms Carlos's entire swimming pool.

2. The sunlight shines directly on Janet's desk but not on Carlos's desk. Both Janet and Carlos are near the window, yet Janet feels much warmer than Carlos.

3. Carlos places a spoon in a steaming hot bowl of soup. Minutes later, the hot handle burns his fingers.
4. Carlos licks a juice pop that he has just removed from the freezer. The tip of his tongue freezes and sticks to the icy-cold treat.

5. When Janet sits near the campfire, her face feels hot even though her back feels cold.

6. When Janet wins first place in the science-fair competition, Carlos shakes her hand. Her hand feels cold to him.

7. Bubbles of liquid in Carlos's lava lamp are heated at the lamp's base. The bubbles then rise to the top. They fall after being cooled.
CHAPTER 9 VOCABULARY REVIEW WORKSHEET

Riddle Me This

After completing Chapter 9, give this puzzle a try!

Using each of the clues below, fill in the letters of the word or phrase being described in the blanks provided on the next page. Then read the words in the vertical box to discover the answer to the following riddle: What do you call a feline unhappy about the excessive thermal energy beneath its feet?

1. the reason a spoon gets hot when it is in a bowl of hot soup
2. the conversion of a substance from one physical form to another
3. the energy needed to change the temperature of 1 kg of a substance by 1°C
4. the Earth’s atmosphere trapping thermal energy radiated by the sun
5. the transfer of thermal energy by the movement of a liquid or gas
6. the measure of the total kinetic energy of the particles in a substance
7. the transfer of energy between objects that are at different temperatures
8. excessive heating of a body of water
9. a material that conducts thermal energy well
10. a machine that uses heat to do work
11. the increase in the volume of a substance due to an increase in temperature
12. the transfer of thermal energy through matter or space as electromagnetic waves
13. the measure of the average kinetic energy of the particles in an object
14. a material that conducts thermal energy poorly
15. the lowest temperature on the Kelvin scale
16. solid, liquid, and gas
Riddle Me This, continued

1. __ __ __ __ __ __ __ __ __ __ __
2. __ __ __ __ __ __ __ __ __ __ __
3. __ __ __ __ __ __ __ __ __ __ __
4. __ __ __ __ __ __ __ __ __ __ __
5. __ __ __ __ __ __ __ __ __ __ __
6. __ __ __ __ __ __ __ __ __ __ __
7. __ __ __ __ __ __ __ __ __ __ __
8. __ __ __ __ __ __ __ __ __ __ __
9. __ __ __ __ __ __ __ __ __ __ __
10. __ __ __ __ __ __ __ __ __ __ __
11. __ __ __ __ __ __ __ __ __ __ __
12. __ __ __ __ __ __ __ __ __ __ __
13. __ __ __ __ __ __ __ __ __ __ __
14. __ __ __ __ __ __ __ __ __ __ __
15. __ __ __ __ __ __ __ __ __ __ __
16. __ __ __ __ __ __ __ __ __ __ __
Complete this activity after you finish reading Chapter 10, Section 2. Examine this map, and answer the questions that follow.

1. Sketch and label the following features using different colors:
   a. the Mississippi River and its major tributaries
   b. the Mississippi River drainage basin
   c. the Continental Divide
   d. the Mississippi Delta
   e. the Rocky Mountains

2. Why do you think the Continental Divide is located where it is?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. The term delta comes from the Greek letter for D. The symbol for capital delta is ∆. Why do you think the name for this symbol is used to describe such a formation?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Complete this worksheet after you finish reading Chapter 10, Section 3.

Imagine that you are living in a frontier town called Dustville in the Wild West. It is 1905, and there is no available running water. All of Dustville’s water must be drawn from a well or found in springs. The mayor of Dustville has asked you to survey the land and drill a well for the town. In the illustration below, choose a good spot for a well, and indicate how deep the hole should be drilled. Remember to choose wisely because the whole town is counting on you.

Why did you choose to locate your well at this point? Use terms from the chapter to explain your answer.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Name ___________________________________________________ Date _________________ Class _____________
After finishing Chapter 10, give this puzzle a try!

ACROSS
1. Process by which material is dropped or settles
4. _______ topography is associated with ground-water erosion.
7. A rock layer that stores and allows the flow of ground water
8. Change in elevation, divided by distance
9. Rocks and soil recently deposited by a river
13. A rock’s ability to allow water to pass through
16. The Nile _______ is a fan-shaped mud deposit at the mouth of the Nile River.
18. The path that a stream follows
19. Volume of water transported by a stream in a given amount of time
20. The water _______ is the continuous movement of water from lakes and oceans into the air, onto land, into the ground, and back to lakes and oceans.

DOWN
2. A river causes _______ by removing rocks and soil from its riverbed.
3. A flood _______ is the surrounding land that can become flooded when a stream overflows its banks.
5. _______ springs form where pressurized water flows through cracks in cap rock.
6. The underground boundary where the zones of aeration and saturation meet
8. The water in rocks below Earth’s surface is called _______ water.
10. Homeowners in some communities use _______ tanks to collect and clean their waste water.
11. Drainage basins are separated from each other by an area of higher ground called a _______.
A Freshwater Puzzle, continued

12. A _____ basin is an area drained by a river system.


15. A small river that flows into a larger river

17. Materials carried in a stream’s water

12. A basin is an area drained by a river system.


15. A small river that flows into a larger river

17. Materials carried in a stream’s water
Imagine that two cousins decide to take a vacation together in the Canadian Rockies, around Banff and Lake Louise. The Canadian Rockies are still filled with glaciers and provide a cool environment for exploring glacial erosion and deposition.

1. First the cousins decide to go on a hike. They come across Bow Falls, where the Bow River thunders down the cliff. What kind of landscape feature might have been carved by a glacier to form the waterfall?

2. After their hike, they decide to go sledding on a glacial slope. What kind of glacier is found in the mountains?

3. Their parents decide to drive them to Moraine Lake, one of the most photographed sites in Canada. What does the name of this lake suggest about its formation and its location?

4. What kind of footing would they expect to find if they took a hike around Moraine Lake?

5. The next stop on the drive is the Columbia Icefield, north of Banff. This sheet of ice was once part of a glacier that covered all of the province of Alberta, Canada, smoothing the landscape. This type of glacier is a ____________________ glacier.

6. Underneath the Columbia Icefield, there is a flowing ice river that runs and dissolves into a lake. What does this suggest about the movement of the glacier?
1. A(n) shoreline is an area near where land and water meet that is made up of material deposited by waves.
2. Deflation is the skipping and bouncing movement of sand-sized particles in the direction the wind is blowing.
3. Till is a thick deposit of windblown, fine-grained sediments.
4. The ship Titanic ran into a(n) glacier.
5. A(n) horn is a mound of wind-deposited sand.
6. Ground moraines form when rock material is dropped at the front of a glacier.
7. Glacial drift is rock material that has been sorted and deposited in layers.
8. A slow movement of material downslope is called mudflow.
9. Arêtes are bowl-like depressions where glacial ice cuts back into mountain walls.
10. U-shaped valleys are small glacial valleys that join deeper main valleys.
11. A(n) landslide is a group of loose rocks that fall or roll down a steep slope.
12. The movement of water parallel to and near the shoreline is called the undertow current.
13. A(n) abrasion is a large crack that forms because ice cannot stretch quickly.
Weaving a Food Web

Complete this worksheet after you finish reading Chapter 12, Section 2. Imagine that you are an ecologist cataloging the interactions in a salt-marsh community. Look at the illustration of some of the organisms that live in a salt marsh, and draw arrows between them to indicate how energy flows between organisms in this ecosystem.

The Salt-Marsh Ecosystem

1. What producer(s) is shown above?

   ____________________________________________

   ____________________________________________

2. What carnivore(s) is shown above?

   ____________________________________________

   ____________________________________________

3. What omnivore(s) is shown above?

   ____________________________________________

   ____________________________________________
Complete this worksheet after you finish reading Chapter 12, Section 3.

In the space provided, indicate whether each of the following symbiotic relationships is an example of mutualism, commensalism, or parasitism.

1. Clownfish live among the poisonous tentacles of a sea anemone. The clownfish are protected from predators, and they keep the sea anemone clean.

2. Barnacles attach themselves to the shells of crabs. The barnacles receive a home and transportation.

3. Bees use a flower's nectar for food, and they carry a flower's pollen to other flowers, allowing the flowers to reproduce.

4. Dutch elm disease has caused mass destruction of elms. The fungus feeds on materials produced by the elm trees.

5. Orchids grow in tree branches. The orchids receive light, and their roots get water from the air.

6. Small mites live on your skin, eating dead skin cells.

7. Lichens are composed of a fungus and an alga. The alga makes food through photosynthesis, and this food is used by the fungus and the alga. The fungus absorbs nutrients from the environment that are used by the fungus and the alga.

8. Tapeworms live in the intestines of cats, where they absorb nutrients from the food the cats eat.
**Try this puzzle after you finish Chapter 12.**

Using each of the clues below, fill in the letters of the word or phrase being described in the blanks provided on the next page.

1. a symbiotic relationship in which both organisms benefit
2. the study of the interactions between organisms and their environment
3. long-term change that takes place in two species because of their close interactions with each other
4. a group of individuals of the same species that live together in the same area at the same time
5. the environment where an organism lives
6. a consumer that eats animals
7. nonliving factors in the environment
8. symbiotic relationship in which one organism benefits and the other is not affected
9. an animal that feeds on the bodies of dead animals
10. two or more individuals or populations trying to use the same limited resource
11. diagram that represents how energy in food molecules flows from one organism to the next
12. consumer that eats a variety of organisms, both plants and animals
13. an organism that eats producers or other organisms for energy
14. triangle-shaped diagram that shows the loss of energy at each level of a food chain
15. the part of the Earth where life exists
16. living factors in the environment
17. an organism’s way of life within an ecosystem
18. symbiotic relationship in which one organism benefits while the other is harmed
19. diagram that represents the many energy pathways in a real ecosystem
20. a consumer that eats plants
21. an organism that eats other organisms, called prey
22. an organism that gets energy by breaking down the remains of dead organisms
23. a community of organisms and their nonliving environment
Environmental Enigma, continued

1. ___ ___ ___ A ___ ___ ___ ___
2. ___ ___ ___ L ___ ___ ___ ___
3. ___ ___ ___ ___ L ___ ___ ___ ___
4. ___ ___ ___ ___ L ___ ___ ___ ___
5. ___ ___ ___ I ___ ___ ___ ___
6. ___ ___ ___ ___ V ___ ___ ___ ___
7. ___ ___ ___ I ___ ___ ___ ___
8. ___ ___ ___ ___ N ___ ___ ___ ___
9. ___ ___ ___ ___ ___ G ___ ___
10. ___ ___ ___ ___ ___ T ___ ___ ___ ___
11. ___ ___ ___ ___ ___ H ___ ___ ___ ___
12. ___ ___ ___ ___ I ___ ___ ___ ___
13. ___ ___ ___ ___ N ___ ___ ___ ___
14. ___ ___ ___ ___ G ___ ___ ___ ___ ___
15. ___ ___ ___ ___ S ___ ___ ___ ___
16. ___ ___ ___ ___ ___ ___ I ___ ___
17. ___ ___ ___ ___ ___ N ___ ___ ___ ___
18. ___ ___ ___ ___ ___ ___ ___ T ___ ___
19. ___ ___ ___ ___ ___ ___ ___ E ___ ___
20. ___ ___ ___ ___ ___ ___ ___ R ___ ___ ___ ___
21. ___ ___ ___ ___ ___ ___ ___ A ___ ___ ___ ___
22. ___ ___ ___ ___ ___ ___ ___ C ___ ___ ___ ___ ___
23. ___ ___ ___ ___ ___ ___ ___ T ___ ___ ___ ___ ___
Complete the worksheet after you have finished reading Chapter 13, Section 3.

Look at this illustration of an ocean environment, and answer the questions below.

1. Label the following zones of the benthic environment on the illustration.
   - Intertidal zone
   - Bathyal zone
   - Sublittoral zone
   - Abyssal zone

2. Label the following zones of the pelagic environment on the illustration.
   - Neritic zone
   - Oceanic zone

3. Why do you think the dolphin was placed at that particular spot in the illustration?
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________

4. Add the following organisms to the illustration by cutting them out and pasting them in the appropriate zones.
   - Seal
   - Fish
   - Crab
   - Worm
Complete this worksheet after you read Chapter 13, Section 5.

1. The diagram below will help you put together the ideas from this chapter. It shows how humans interact with the ocean in both positive and harmful ways. Complete the diagram by reviewing the appropriate sections of the chapter. On each of the blank lines, fill in one or two words that are appropriate.

2. Use the completed diagram to help you list positive and negative ways that humans interact with the oceans. Include at least four items in each list.

   a. Positive effects:

   b. Harmful effects:
Give this puzzle a try after you finish Chapter 13.
Use the clues below to complete the crossword puzzle on the next page.

ACROSS
1. The zone that begins where the intertidal zone ends
3. The land under the ocean is divided into the deep-ocean basin and the _______ margin.
5. Zone of the benthic environment whose depth ranges from 200 to 4,000 m below sea level
6. Underwater mountain of volcanic material
7. The base of the continental slope is called the continental _______.
9. The steepest part of the continental margin is called the continental _______.
10. The flattest part of the continental margin is called the continental _______.
13. Water that falls to Earth as rain or snow
17. The deepest zone of the benthic environment
19. The water _______ includes evaporation, condensation, and precipitation.
20. The _______ zone includes the water that covers the continental shelf.
22. Removing salt from sea water
23. The broad, flat portion of the deep-ocean basin that is covered by ooze is called the abyssal _______.

DOWN
2. Organisms that live in mud, sand, and rock on the ocean floor
4. The shallowest benthic zone
8. The benthic _______ is the ocean floor and all the organisms that live on it or in it.
9. The measure of the amount of dissolved solids in a given amount of liquid
11. Swimming marine organisms
12. Almost three quarters of the Earth’s surface is covered with _______.

CHAPTER 13 VOCABULARY REVIEW WORKSHEET
Oceanology
13. The water in the ocean and the organisms that live above the ocean floor make up the ______ environment.
14. Most of Earth’s water is found in the ______.
15. The deepest place on the Earth’s surface is in an oceanic ______.
16. Microscopic organisms that float in surface waters
18. The zone in the benthic environment that contains black smokers and tube worms is called the ______ zone.
21. A ______ valley can be found on the ocean floor.
Complete this worksheet after you finish reading Chapter 14, Section 2.

Your pen pal, Hannah, lives in the desert of Tucson, Arizona. In her last letter, Hannah wrote that she will be visiting the beach for the first time during a family vacation to California. She said she was excited about her trip but needs you to help her out with something. Since Hannah’s class hasn’t studied the ocean yet, she was wondering if you would share with her what you know about it. She mentioned that she was particularly curious about the waves.

First match the terms and definitions below, and then use this information to write Hannah a letter explaining what you know. Be sure to include any diagrams that might help explain things more clearly!

- crest
- trough
- wavelength
- wave height
- wave period
- breaker zone
- surf
- whitecap
- swells

a. an area near the shore where waves begin to tumble downward, or break
b. the vertical distance between a wave’s crest and its trough
c. rolling waves that move across the ocean in a steady procession and that form from calm winds
d. the lowest point of a wave
e. the time it takes for two waves to pass a fixed point
f. the distance between two adjacent wave troughs or wave crests
g. an area between the breaker zone and the shore
h. the highest point of a wave
i. waves that are foamy with steep crests and that break in the open ocean; form during stormy weather
Dear Hannah,

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________


Your friend, __________________________
Dear Hannah,

It’s great that you will be visiting the beach for the first time! Did you know that the level of the ocean’s surface changes daily? These changes, called ________________, are influenced by the ________________ and the ________________.

The gravity of the ________________ has a more noticeable pull on liquids than on solids because liquids move more easily. The side of the Earth that is facing the moon experiences the strongest pull. The pull forces ocean water to bulge, creating a ________________. Even an ocean facing away from the moon bulges because of the way the Earth and moon are moving around each other. Water is pulled into the bulges from the areas between the high tides, creating a ________________ in each area. An especially strong tide, called a ________________, occurs during the new and full moons when the sun, Earth, and moon are aligned. But when the sun, Earth, and moon form a 90-degree angle, high and low tides don’t vary as much, and a ________________ occurs. The last type of water movement I remember learning about has a strange name. A ________________ occurs in estuaries, bays, or other narrow coastal ________________. When the high tide comes in, water rushes into these areas and causes a sudden rise in the water level.

I hope you find this information useful. It definitely made me take a second look at the ocean!

Your friend, ____________________
After you finish Chapter 14, give this puzzle a try!
This game may be played individually or in teams. You are supplied with the answers to questions in four categories. Your challenge is to come up with the correct question for each answer. Each correct “question” has a point value corresponding to the number at the beginning of the row. Keep a running total of your points as you play.

<table>
<thead>
<tr>
<th>Pts.</th>
<th>A current affair</th>
<th>Tide you over</th>
<th>Surf’s up</th>
<th>Basic anatomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Streamlike movements of ocean water far below the surface</td>
<td>Daily movements of ocean water that change the level of the ocean’s surface</td>
<td>White, foaming waves with steep crests that break in the open ocean</td>
<td>Horizontal distance between the high point of two waves</td>
</tr>
<tr>
<td>200</td>
<td>The turning of moving objects by Earth’s rotation</td>
<td>The difference between levels of ocean water at high and low tide</td>
<td>The area near shore where waves first begin to tumble downward</td>
<td>Vertical distance between the high and low point of a wave</td>
</tr>
<tr>
<td>300</td>
<td>The Gulf Stream, for example</td>
<td>Tides caused by the alignment of the sun, Earth, and moon</td>
<td>Rolling waves that move in a steady procession across the ocean</td>
<td>The highest point of a wave</td>
</tr>
<tr>
<td>400</td>
<td>The area between the breaker zone and the shore</td>
<td>Tides that occur when the sun, Earth, and moon form a 90° angle</td>
<td>A wave that can be caused by earthquakes or volcanic eruptions</td>
<td>The time it takes for two waves to pass a fixed point</td>
</tr>
<tr>
<td>500</td>
<td>Process in which cold, nutrient-rich water from the deep ocean rises to replace surface water</td>
<td>Occur as high tides rise in narrow coastal inlets</td>
<td>A local rise in sea level near the shore caused by strong winds from storms</td>
<td>The lowest point of a wave</td>
</tr>
</tbody>
</table>

Total points: ____________
Complete this worksheet after you finish reading Chapter 15, Section 1.
The Earth’s atmosphere is divided into four layers. Choose the layer in Column B that best matches the description in Column A, and write your answer in the space provided. Then, use the directions below to label the diagram of the Earth’s atmosphere on the next page.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ 1. the layer of the Earth’s atmosphere that you live in</td>
<td>a. troposphere</td>
</tr>
<tr>
<td>___ 2. the coldest layer of the Earth’s atmosphere;</td>
<td>b. stratosphere</td>
</tr>
<tr>
<td>lies directly below the uppermost layer</td>
<td>c. mesosphere</td>
</tr>
<tr>
<td>___ 3. the uppermost layer of the atmosphere</td>
<td>d. thermosphere</td>
</tr>
<tr>
<td>___ 4. the layer that contains most of the atmosphere’s ozone; above the</td>
<td></td>
</tr>
<tr>
<td>layer that you live in</td>
<td></td>
</tr>
</tbody>
</table>

5. Label the four layers of the atmosphere on the diagram on the next page.
6. There is no clear boundary between the uppermost layer of the atmosphere and space. The atmosphere becomes thinner and thinner and blends into space. At the very top of the diagram, write the word space with an arrow pointing up.
7. The ozone layer is in the upper part of the atmospheric layer that contains most of the atmosphere’s ozone. Use the symbol for ozone to draw in the ozone layer on the diagram.
8. The ozone layer is important because it absorbs ultraviolet radiation. Draw a wavy line coming from space to represent the UV radiation that is absorbed by the ozone layer.
9. The thermosphere contains ions, which are electrically charged particles. When nitrogen and oxygen atoms absorb solar energy, they become ions. Draw the ions in the thermosphere. Remember that the thermosphere is very thin and that there are almost no ions near the top of the thermosphere.
10. The troposphere is the densest layer of the atmosphere. It is much denser than the other layers. Shade this layer heavily to indicate how dense it is.
11. The stratosphere is very thin. Shade this layer lightly.
12. The mesosphere is even less dense than the stratosphere. Shade this layer very lightly.
Earth’s Amazing Atmosphere, continued

Key

- Density
- Ozone
- Ions
- UV radiation

Altitude

- 80 km
- 50 km
- 16 km
- 0 km

Earth
In the Air

After you finish reading Chapter 15, try this crossword puzzle!
Use the clues below to complete the crossword puzzle on the next page.

ACROSS
2. atmospheric layer above the troposphere
6. height of an object above the Earth’s surface
7. the coldest layer of the atmosphere
8. pollutants such as ozone or smog
11. the effect that causes objects to move in a curved direction due to the Earth’s rotation
12. a device used to remove pollutants from smokestacks
15. wind belts that extend from the poles to 60° latitude
18. molecule made up of three oxygen atoms
20. moving air
21. pollutants in the air because of human activity
22. the effect in which gases in the atmosphere convert absorbed radiation into heat
23. heat transfer from one material to another by direct contact

DOWN
1. narrow belts of high-speed winds
3. winds that blow from 30° latitude to the equator
4. the uppermost atmospheric layer
5. mixture of gases that surrounds the Earth
9. the measure of the force with which the air molecules are pushing on a surface
10. a rise in average global temperatures
13. movement of heat by a liquid or gas
14. global winds found between 30° and 60° latitude
16. damaging precipitation caused by oxides of sulfur and nitrogen
17. the layer of the atmosphere where we live
19. energy that travels in waves
In the Air, continued
Complete this worksheet after you have finished reading Chapter 16, Section 3.
The table below will help you to compare and contrast the different types of severe storms. Fill in the table according to the directions.

1. Describe the conditions under which each storm is most likely to occur. Name the regions where these storms occur most frequently.
2. Describe how each storm forms.
3. In two sentences describe a possible aftermath of a severe occurrence of each type of storm.

<table>
<thead>
<tr>
<th>Conditions/Region</th>
<th>Formation</th>
<th>Aftermath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hailstorm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thunderstorm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditions/Region</td>
<td>Formation</td>
<td>Aftermath</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Tornado</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hurricane</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
After completing Chapter 16, give this puzzle a try!
Use the clues below to complete the crossword puzzle on the next page.

ACROSS

1. Weather that can cause property damage and even deaths
4. Weather map symbol representing a weather station
6. Puffy white clouds with flat bottoms
8. Amount of moisture the air contains compared with the maximum amount it can hold at a particular temperature
9. Funnel cloud that touches the ground
12. Continuous movement of water from water sources to the air, to the ground, and back to water sources
13. Mercury-filled glass tube used to measure air temperature
15. Cone-shaped cloth bag open at both ends for measuring wind direction
17. Used to measure relative humidity
19. Sound that results from the rapid expansion of air along a lightning strike
20. Water in solid or liquid form that falls from the air to the Earth
22. Temperature at which air is fully saturated
23. Mercury-filled glass tube used to measure air pressure
26. When liquid water changes into water vapor
27. Process by which plants release water vapor into the air through their leaves
29. Freezing rain
30. Small, intense weather system that produces strong winds, heavy rain, lightning, and thunder

DOWN

2. Prediction of weather conditions
3. Large body of air that has similar temperature and moisture throughout
5. Boundary between two air masses
6. When water vapor becomes a liquid
7. Collection of millions of tiny water droplets or ice crystals
10. Rotating cups that measure wind speed
11. Clouds that form in layers
14. Large, rotating tropical weather system with high-speed winds
16. Amount of moisture in the air
18. Tool shaped like an arrow that indicates wind direction
21. Thin, feathery clouds at high altitudes
24. Solid precipitation that falls as balls or lumps of ice
25. Most common form of solid precipitation
28. Water from precipitation that flows across land and collects in rivers and streams
1. Label the tropic of Cancer and the tropic of Capricorn on the map. (Hint: They are already drawn for you. The tropic of Capricorn is south of the equator.)

2. The tropical zone lies between the tropic of Capricorn and the tropic of Cancer. Label the tropical zone on the map.

3. The polar zone lies above 66.5°N and below 66.5°S. Label the polar zone on the map.

4. The temperate zone is the zone between the polar and tropical zones. Label the temperate zone on the map.
Look at the table below. The three cities listed in the table are shown on the map on the previous page. For each city, label the appropriate climate zone. Then complete the table by writing the notes listed at the bottom of this page in the appropriate spaces in the table. Some of the notes will be used more than once. You may want to review the material on latitude in Section 1 of your text to help you with this exercise.

### How Latitude Affects the Seasons

<table>
<thead>
<tr>
<th>City and climate zone</th>
<th>December 31</th>
<th>June 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrow, Alaska</td>
<td></td>
<td></td>
</tr>
<tr>
<td>zone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quito, Ecuador</td>
<td></td>
<td></td>
</tr>
<tr>
<td>zone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santiago, Chile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>zone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

- summer
- winter
- not much seasonal change
- almost 24 hours of night
- about the same length of day and night
- night is longer than day
- day is longer than night
After you finish learning about climate in Chapter 17, give this worksheet a try!

Rocky and Rudolph are imaginary travelers through time and space. They keep a journal of their trips, but they usually forget to take an Earth science dictionary with them, so they leave some words blank. Read about their latest adventures, and fill in the blank spaces with the vocabulary words listed on the next page.

**Day One**

The ____________ today is so hot and humid where we live that we have decided to go back in time 2 million years, to the beginning of the most recent ____________. During this glacial period, enormous sheets of ice advanced across the continents toward the equator. Many of the Earth’s ____________ were much colder than they are now, so we should be guaranteed some cool temperatures.

**Day Two**

Today we’re going to tour some of the Earth’s ____________, large regions that are characterized by specific climates, plants, and animals. First we’ll go to the equator, which is at 0° ____________. The equator is in the ____________ zone because it is located between the tropic of Capricorn and the tropic of Cancer. This zone has the highest average temperatures on Earth, so we might visit a mountain while we’re there. After all, temperature decreases as ____________ increases. And who knows? We may find a ____________ on the mountain that has characteristics different from those found in the areas around the mountain.
Then we'll visit the _________________ zone, which has the coldest average temperatures on Earth. This might be a lot like our trip back in time to see the glaciers!

Last but not least, we'll visit the _________________ zone, which has moderate temperatures. We plan to visit the forests in this zone. Rocky wants to see _________________ trees, which keep their leaves all year long, and I want to see _________________ trees, which lose their leaves during the winter.

**Day Three**

This trip will be into the future to see the effects of _________________ on the Earth. We might see shrunken coastlines and crop failures in the Midwest. Scientists think that this rise in global temperatures is caused by the _________________, in which gases such as carbon dioxide trap heat in the Earth’s atmosphere.

Rocky wants to take the sailboat out for a spin. We will try to hit a region where the _________________ blow in the same direction that the ocean’s _________________ move so that we can sail at maximum speed. I just want to be sure that we don’t forget the sunscreen!

**Vocabulary Words**

- biomes
- temperate
- global warming
- climates
- elevation
- surface currents
- deciduous
- polar
- greenhouse effect
- latitude
- weather
- prevailing winds
- ice age
- microclimate
- evergreen
- tropical
Complete this worksheet after you finish reading Chapter 1, Section 1.

Read the scenes below, and explain what kind of Earth scientist is described. Write your answers in the space provided. Be as specific as possible.

<table>
<thead>
<tr>
<th>Scene 1</th>
<th>Scene 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the desert of New Mexico, a young woman observes the stars every night and makes star charts. She notices a speck of light in the “Square Constellation” that she has never noticed before.</td>
<td>A university professor is at Point Reyes National Seashore, in California, measuring the depth of the tidal pools. As the day grows later, the tidal pools get deeper.</td>
</tr>
<tr>
<td>astronomer</td>
<td>physical oceanographer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scene 3</th>
<th>Scene 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is winter in Michigan. A young man in Kalamazoo is looking at a satellite weather map. He predicts snow flurries across southern Michigan for the next 2 days.</td>
<td>It is a cloudy day in the state of Washington. An experienced scientist is observing Lava Canyon, on the volcano Mount St. Helens. She notices that all the trees on the canyon floor are missing limbs near their bases.</td>
</tr>
<tr>
<td>meteorologist</td>
<td>volcanologist</td>
</tr>
</tbody>
</table>

Which of the four areas of Earth science represented in these scenes is most interesting to you? Why?

Accept any reasonable answer. Sample answer: I am interested in astronomy because I like star-gazing. I know some constellations and am looking forward to learning more about how stars form.
After finishing Chapter 1, give this puzzle a try!

**ACROSS**

1. The study of the atmosphere
4. The study of the surface features of the Earth
6. The study of the ocean
7. The study of all physical things beyond the planet Earth
9. ______ warming is a worldwide increase in temperature.
13. Combines geology and chemistry
15. The amount of space that something occupies
17. A unifying explanation for a broad range of hypotheses and observations supported by testing
18. The study of maps of the surface features of the Earth
19. Volume is often given in this unit.

**DOWN**

2. The study of the solid Earth
3. The basic SI unit of mass
5. A possible explanation or answer to a question
8. Scientists use the scientific ______ to answer questions.
10. A representation of an object or system
11. The special area of question 6 across that deals with waves and currents
12. The study of ecosystems
14. The basic SI unit of length
16. The amount of matter that something is made of
1. a. Name three cities shown on the map that have about the same latitude, and give the latitude.
   Reno, Denver, and Philadelphia are all at about 40° north.

   b. Estimate the longitude of the three cities you named in part a.
   Reno: about 120° west
   Denver: about 105° west
   Philadelphia: about 75° west

2. a. Name three cities shown on the map that have about the same longitude, and give the longitude.
   Charleston, Charlotte, and Buffalo are all about 80° west.

   b. Estimate the latitude of the three cities you named in part (a).
   Charleston: about 33° north
   Charlotte: about 35° north
   Buffalo: about 43° north
Imagine you are taking a hike through a national park. The park ranger gives you a topographic map to help you find your way. Use the map below to answer the following questions.

1. At what end of the park is the ranger's station?
   a. northwest  
   b. southwest  
   c. southeast  
   d. northeast

2. How many trees are in the park? ______ 7

3. At what elevation is the ranger's station? ______ 450–499 m

4. At what elevation is the bridge? ______ 700–749 m

5. How many cabins are at or above an elevation of 750 m? ______ 2

6. How high is the highest point in the park? ______ 1,050 m

7. What is in the northwest corner of the park?
   a. a mountain  
   b. a depression  
   c. a lake  
   d. a hill

8. How long is the path that takes you from the ranger's station to the lake? ______ 8–10 km

9. What is the contour interval of this map? ______ 50 m

10. The river has eroded away some of the soil. What feature of the topographic map indicates this?
    The V-shaped contour lines show that the river has cut a valley into the landscape.
After finishing Chapter 2, give this puzzle a try!

Below is a treasure map. By choosing the correct answers and following the directions that correspond to those answers, you should find the treasure.

In order to keep track of where you are going, circle each correct answer. Start at the place labeled “Home” on the treasure map. Each line on the grid represents 10° longitude or latitude. Mark your path in pencil in case you make a mistake and need to start over.

1. a way to find the variation from true north
   - Follow the arrow on a compass. (Go 20° north.)
   - Factor in the magnetic declination. (Go 10° east.)

2. the geographic North Pole
   - true north (Go 30° north.)
   - magnetic north (Go 10° south.)
Where's the Treasure? continued

3. can be used to compare elevations
   cardinal directions  contour lines
   (Go 20° east.)  (Go 30° west.)

4. 0° longitude
   prime meridian  equator
   (Go 30° north.)  (Go 20° east.)

5. gathering information without anyone being there
   remote sensing  azimuthal projection
   (Go 10° east.)  (Go 20° south.)

6. the difference in elevation between one contour line and another
   contour interval  contour index
   (Go 10° south.)  (Go 10° west.)

7. a projection map that has parallel lines of longitude and latitude
   conic  Mercator
   (Go 30° south.)  (Go 20° east.)

8. lines that go through the poles
   latitude  longitude
   (Go 10° west.)  (Go 10° south.)

9. the height of an object above sea level
   elevation  relief
   (Go 20° east.)  (Go 20° north.)

Where is the treasure?

The treasure is at Palm Bay.
Complete this worksheet after you finish reading Chapter 3, Section 2. Use Sections 1 and 2 of the text and the clues given below to name each mineral.

**Feldspar**
- Clues: silicate
  - makes up about half of Earth’s crust
  - pinkish crystals in granite
- Name: __________

**Calcite**
- Clues: contains oxygen and carbon
  - softer than fluorite but harder than gypsum
  - effervesces when it contacts an acid
- Name: __________

**Halite**
- Clues: nonsilicate
  - contains sodium and chlorine
  - breaks at 90° angles in three directions
- Name: __________

**Mica**
- Clues: nonsilicate
  - breaks at 90° angles in three directions
- Name: __________

**Fluorite**
- Clues: contains fluorine
  - nonsilicate
  - glows under ultraviolet light
- Name: __________

**Gold**
- Clues: nonsilicate
  - native element
  - has a specific gravity of 19
- Name: __________
Complete this worksheet after you finish reading Chapter 3, Section 2.

**Announcer Don Fargo:** It’s time to play your favorite quiz game—The Mineral Quiz! Now here’s your host, Hackly Halite! Take it away, Hackly. . . (Applause)

**Hackly:** Thank you very much everyone. Let’s begin!!! Our first category is “Luster.”

For 100 points, luster is the way the surface of a mineral reflects _______ light _______. For a bonus of 50 points, fill in the blank: A vitreous luster is _______ nonmetallic _______. (metallic or nonmetallic)

**Don:** Now it’s time for a word from our sponsors, Inorganic Crystals. Remember, minerals have a repeating inner structure!

**Hackly:** Hey, we’re back! Our new category is “Cleavage.”

For 100 points, cleavage is the tendency of some minerals to break along _______ flat _______ surfaces. For a 50-point bonus, describe the cleavage of a diamond.

A diamond breaks in four different directions.

I think we have time for one more category—“Hardness”!

For 100 points, _______ talc _______ is the softest reference mineral on the Mohs’ hardness scale.

For a 50-point bonus, what is the hardest reference mineral on the Mohs’ scale? _______ diamond _______ (Buzzer sounds)

**Don:** You know what that means! It’s time to play the Bonus Round! Each question is worth 75 points.

**Hackly:** Fill in the blanks below for bonus points!

All silicate minerals contain _______ silicon _______ and _______ oxygen _______.

Conchoidal is a type of _______ fracture _______.

_______ Streak _______ is more reliable than color as an indicator of a mineral’s identity.

**Hackly:** Well, that’s all the time we have for today. Thanks so much for playing The Mineral Quiz! (Applause)
After you finish Chapter 3, give this puzzle a try!

For each of the clues below, fill in the letters of the word or phrase being described in the blanks provided on the next page.

1. inorganic solid with a crystalline structure found in nature
2. shiny luster
3. the way a surface reflects light
4. the tendency of minerals to break unevenly
5. Mohs’ scale measures ________.
6. the smallest part of an element that has all the properties of the element
7. substances that cannot be broken down by chemical means
8. the tendency of a mineral to break along flat surfaces
9. type of mineral that contains oxygen and silicon
10. the amount of matter in a given space
11. solid, geometric forms of minerals produced by a repeating pattern of atoms
12. color of the powdered form of a mineral
13. returning the land to its original state after mining
14. a mineral deposit large enough and pure enough to be mined for a profit
15. halides, oxides, sulfates, sulfides, carbonates, and native elements are ________ minerals.
16. helps conserve nonrenewable resources by reducing our need for minerals
17. nonsilicate minerals containing sulfur and oxygen
18. Minerals that look like plastic have a ________ luster.
19. a substance made of two or more elements that have been chemically joined
20. Minerals can form in these small teardrop-shaped formations.
21. Specific ________ is the ratio of an object’s density to that of water.
22. a cubelike class of crystals
23. not a reliable indicator of a mineral’s identity because it can be changed by weathering
24. type of mining in which shafts and tunnels are dug underground to reach the ore
Digging Deeper, continued

1. MINERAL
2. METALLIC
3. LUSTER

4. FRAC TURE
5. HARDNESS
6. ATOM

7. ELEMENT

8. CLEAVAGE
9. SILICATE
10. DENSITY
11. CRYSTALS
12. BREAK
13. RECLAMATION
14. ORE
15. NONSILICATE

16. RECYCLING
17. SULFATES

18. RESINOUS
19. COMPOUND
20. PEGMATITES

21. GRAVITY
22. ISOMETRIC
23. COLOR
24. DEEP
What Is It?

Complete this worksheet after you finish reading Chapter 4, Section 4.

In the boxes on the left, identify the rock being described as sedimentary, igneous, or metamorphic. Then in the boxes on the right, write the appropriate description in the blanks provided.

<table>
<thead>
<tr>
<th>It can be distinguished by its layers. It comes in two main categories, clastic and chemical. Its origin is layers of sediment. What is it?</th>
<th>Fill in the blanks below with clastic or chemical. Clastic rocks are formed when rock or mineral fragments stick together. Chemical rocks are formed from solutions of minerals and water.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a sedimentary rock</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>It is a result of change in the structure, texture, or composition of a rock. It comes in two textures, foliated and nonfoliated. Its origin is intense heat and pressure. What is it?</th>
<th>Fill in the blanks below with foliated or nonfoliated. In foliated rock, the mineral grains are aligned, but in nonfoliated rock, they are not aligned.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a metamorphic rock</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Write a riddle like those above for the third kind of rock. Accept any reasonable answer. Sample answer: It is the result of the cooling down of magma. It can be intrusive or extrusive. Its origin is magma. What is it? an igneous rock</th>
<th>What kind of rocks are formed when the magma cools on Earth’s surface? extrusive igneous rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What kind of rocks are formed when the magma cools beneath Earth’s surface? intrusive igneous rocks</td>
</tr>
</tbody>
</table>
After finishing Chapter 4, give this game a try!

This game is for two people, X and O. A third person should serve as the referee.

Definitions:
A. The makeup of a rock, usually according to the minerals present in it
B. Igneous rock that forms when lava cools and solidifies on the Earth's surface
C. The texture of metamorphic rock in which mineral grains are aligned
D. Rock that forms when magma or lava cools and solidifies beneath the Earth's surface
E. Igneous rock that forms when magma cools and solidifies beneath the Earth's surface
F. A solid mixture of crystals of one or more minerals
G. Hot liquid that forms when rock partially or completely melts
H. Rock that forms when the texture and composition of a preexisting rock change due to heat or pressure
I. The texture of metamorphic rock in which mineral grains show no alignment
J. The process by which one rock type changes into another rock type
K. Rock that forms when sediments are pressed and cemented together
L. The layering of sedimentary rock
M. The sizes, shapes, and arrangement of particles or grains that make up a rock
N. Hot liquid that erupts onto the Earth's surface
O. Long cracks in the Earth's surface
P. The layers of sedimentary rock

Rules
1. Choose who goes first.
2. Pick a square below, and find the definition in the list to the left that matches the word in the square. The referee will check to see if you picked the correct definition.
3. If the definition is correct, mark the square with your letter.
4. Your opponent chooses another square and finds its definition.
5. Continue playing until one player has four X's or O's in a row horizontally, vertically, or diagonally.
Complete this worksheet after you finish reading Chapter 5, Section 1.

Something that people use that comes from the Earth is known as a natural resource. There are a lot of natural resources on the Earth, and they are broken up into two types—renewable and nonrenewable. You might be wondering what the difference is between these two. The difference has to do with how long it takes to replace the resource. Renewable resources, such as trees, can be replaced in a relatively short time after they are used. But a nonrenewable resource, such as coal, can take thousands or millions of years to replace.

Because it takes such a long time to replace nonrenewable resources, whatever amount exists on Earth right now is limited.

Take a look at the pictures below, and label each item with an R if it is renewable or with an N if it is nonrenewable. Write your answer on the line provided.
Millions of years ago the fossil remains of once-living organisms were buried deep in the Earth. These fossils are what give us fossil fuels. Fossil fuels are nonrenewable energy resources that come in three forms—solid, liquid, and gas. Using the terms listed below, fill in the diagram that follows. Terms may be used more than once.

**Fossil Fuels**

- **Form**
  - solid
  - liquid
  - gas

- **From**
  - decayed swamp plants
  - decayed sea life
  - a rock

- **Primary name**
  - coal
  - petroleum
  - natural gas

- **Specific example**
  - butane
  - kerosene
  - butane

- **Terms**
  - solid
  - liquid
  - decayed swamp plants
  - gas
  - petroleum
  - decayed sea life
After finishing Chapter 5, give this puzzle a try!
In each of the following items, use the clue to unscramble the letters, and write the term in the corresponding blanks.

1. fuel made from gasoline and alcohol: HOSLGOA
   \[\text{GASOLINE}\]

2. produced when sunlight acts on automobile exhaust: OGMS
   \[\text{SMOG}\]

3. an example of this is using old newspapers to make the paper for new newspapers: YIERCGLCN
   \[\text{RECYCLING}\]

4. the only fossil fuel that is a rock: ALOC
   \[\text{COAL}\]

5. energy from the sun: LSOAR EERINGY
   \[\text{SOLAR ENERGY}\]

6. examples are trees and fresh water: BAREEMLW OEECSRUR
   \[\text{RENEWABLE RESOURCES}\]

7. the method used to extract shallow deposits of coal from the Earth: STPRI INMGIN
   \[\text{STRIP MINING}\]

8. created because the sun heats air unevenly: NWDI GYREEN
   \[\text{WIND ENERGY}\]

9. rain or snow that contains a high amount of sulfuric acid: ADCI REIPNTITCIAPO
   \[\text{ACID PRECIPITATION}\]

10. examples are oil and natural gas: BELWENNEARON SEORCUERS
    \[\text{NONRENEWABLE RESOURCES}\]

11. created by falling water: DECHOLRIETY RC NREGY
    \[\text{HYDRO ELECTRIC ENERGY}\]
Energetic Anagram, continued

12. a natural resource that people use to make energy: GREENY EERUOCSP
   ENERGY RESOURCE

13. the term for organic matter that contains stored energy: OSBSIMA
   BIOMASS

14. formed from once-living organisms whose remains were buried: ISLSFO SUFEL
   FOSSIL FUELS

15. used to generate electricity or for heating: UATLNAR AGS
   NATURAL GAS

16. comes from the nuclei of atoms: NCLUAER EYEGNR
   NUCLEAR ENERGY

17. an organism, energy form, or natural substance used by living things:
   TANLUAR CSORUREE
   NATURAL RESOURCE

18. substance that gasoline, jet fuel, and diesel fuel are made from: TPEUROMEL
   PETROLEUM

19. produced by heat below the Earth’s surface: EHRELGAMOT YENGRE
   GEOTHERMAL ENERGY

Now, go back through items 1–19. Group the numbered letters together by number, and unscramble each group to make a word. Then, write the unscrambled word for each group in the corresponding boxes to form a statement about our use of natural resources.

TOGETHER WE CAN
1 1 1 1 1 1 2 2 3 3 3

USE WISELY!
4 4 4 5 5 5 5 5 5 5
Complete this worksheet after you finish reading Chapter 6, Section 1.

Use the following terms to label the diagram below. Then use the terms to fill in the blanks in the sentences that follow. Terms may be used more than once.

- crust
- outer core
- mantle
- inner core
- mesosphere
- asthenosphere
- tectonic plate

**What Am I?**

I am part of the lithosphere, but I move around on top of the asthenosphere. I am a(n) _______ tectonic plate _______.

**Where Are We?**

We journeyed to the center of the Earth, and when we got there we discovered that the core has two parts! One part is liquid and is called the _______ outer core _______. The other part is dense and solid and is called the _______ inner core _______.

---

**REINFORCEMENT WORKSHEET**

**The Layered Earth**

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Name ___________________________ Date __________ Class ___________
Complete this worksheet after you finish reading Chapter 6, Section 3.
The theory of plate tectonics explains that the Earth’s lithosphere is divided into tectonic plates. These tectonic plates move in relation to one another. An area where two plates meet is called a boundary.
There are three types of boundaries, and each defines the type of motion that takes place when two plates meet. Using the following hints, label each diagram with the kind of boundary being shown.

Types of Boundaries

**Convergent:** This word is the adjectival form of the word converge. To understand the meaning of this word, pretend you and a friend are on opposite sides of a room and you both walk toward a chair that is at the center of the room. When you meet each other at the chair, you have converged on the chair. In other words, you have come together so that you meet at the same place.

**Divergent:** This word comes from the word diverge, which means the exact opposite of the word converge. In this case, you and your friend stand back to back at the center of the room and walk away from each other.

**Transform:** This word means “to change the form or appearance of something.” It does not specify how the change occurs; it just tells that a change is taking place.

---

[Diagram of three types of boundaries:
- Divergent
- Transform
- Convergent]
After finishing Chapter 6, give this puzzle a try!
Use the clues to help you unscramble the words given. Write your answer in the spaces provided.

1. the tectonic process that takes place along mid-ocean ridges: AES RFOOL REGIDANSP
   - SEA FLOOR SPREADING

2. the breaking and sliding surface between blocks of crust: LFUTA
   - FAULT

3. the strong, lower part of item 17: OEEEMPShr
   - MESOSPHERE

4. the place where two tectonic plates push into one another: VNONTRGECE NBURAYOD
   - CONVERGENT BOUNDARY

5. the layer of Earth that is made mostly of iron: RCEO
   - CORE

6. term that describes the bending of rock layers due to stress: IFLGNOD
   - FOLDING

7. the solid, dense center of the Earth: NNERI CREO
   - INNER CORE

8. the place where two tectonic plates move away from one another: EIREVNDGT YUNADBRO
   - DIVERGENT BOUNDARY

9. occurs when the hanging wall moves up relative to the footwall: EEVRERS UTLFA
   - REVERSE FAULT

10. the layer of solid rock that flows very slowly: SEEONHTAPSRHE
    - ASTHENOSPHERE

11. a theory that says the lithosphere is divided into plates that move around on top of the asthenosphere: ATPLE ICESTNOTC
    - PLATE TECTONICS
Earthly Anagrams, continued

12. the type of stress that occurs when two of item 23 collide: ONOSERCISMP
   COMPRESSION

13. the layer of the Earth made up of items 21 and 17: LHETPHESROI
   LITHOSPHERE

14. a region where oceanic plates sink down into the asthenosphere:
   SOUITNDCBU NEZO
   SUBDUCTION ZONE

15. the liquid layer of the Earth beneath item 17: ROUTE ECRO
   OUTER CORE

16. occurs when the hanging wall moves down relative to the footwall:
   AORNLM LAUFT
   NORMAL FAULT

17. the layer of Earth that has the most mass: METNAL
   MANTLE

18. occurs when opposing forces cause rock to break and move horizontally:
   SETKIR IPSL ATULF
   STRIKE SLIP FAULT

19. the theory that continents move apart from each other: TCOITAENLNN FDTRI
   CONTINENTAL DRIFT

20. type of stress in a stretched rubber band: TSENNIO
   TENSION

21. the layer of Earth on which we live: RCSUT
   CRUST

22. the place where two tectonic plates slide past each other horizontally:
   AFRMTONSRYNUDBROA
   TRANSFORM BOUNDARY

23. pieces of the “rock sphere”: ENCCTITO TPSAEL
   TECTONIC PLATES

24. the amount of force per unit area put on a given material: TSRSES
   STRESS
Complete this worksheet after you finish reading Chapter 7, Section 2.

Imagine that you are an editor for a newspaper and are about to edit an article that must go to press tonight. You got the article just minutes before the reporter left for the airport to begin his 2-week vacation. Yet, now that you are finally sitting down to edit the article, you notice that there are important bits and pieces missing from the first two paragraphs! Using the list of words that are given below, fill in all the missing bits of information so the article can be included in tomorrow morning's edition. Some words may be used more than once. Good luck!

**Spotlight on a Scientist**

This week we'll be visiting with a ______ seismologist ______. Molly Goodman is right here in our hometown. Molly said that a break in the Earth's crust, called a ______ fault ______, got her interested in the field of ______ seismology ______. She was fascinated when she learned that a ______ fault ______ is the result of tectonic plates in the Earth's crust moving in different directions. As the plates move, they cause ______ deformation ______, which is a change in the shape of rocks due to stress. Because the rock deforms like a piece of molded clay during ______ plastic deformation ______, only ______ elastic deformation ______, in which the rock behaves like a breaking rubber band, leads to earthquakes.

One of the most important pieces of equipment Molly uses every day is an earthquake-sensing instrument called a ______ seismograph ______, which records seismic waves. These waves are a type of energy that moves through the Earth. They are caused when rocks in the tectonic plates are deformed and spring back to their original shape. This is called ______ elastic rebound ______. The seismograph traces the movement of these waves in a line called a ______ seismogram ______. A ______ seismologist ______ uses these lines to find the ______ epicenter ______ of an earthquake. The ______ epicenter ______ is the point on the Earth's surface right above the starting point of an earthquake. Just beneath this point is the ______ focus ______. The ______ focus ______ is the area inside the Earth where the earthquake begins.

**Vocabulary**

- seismograph
- epicenter
- seismology
- seismologist
- elastic deformation
- elastic rebound
- focus
- plastic deformation
- fault
- seismogram
- deformation
After finishing Chapter 7, give this puzzle a try!

ACROSS
3. break in the Earth’s crust along which portions of the Earth’s crust move relative to one another
4. the study of earthquakes
5. point inside the Earth where an earthquake begins
8. point on Earth’s surface directly above an earthquake’s starting point
11. the fastest seismic waves
13. secondary seismic waves
14. Sections of active faults that have had few earthquakes are likely to be sites of strong earthquakes.
15. a tracing of earthquake motion

DOWN
1. change in shape of rock due to stress
2. sudden return of elastically deformed rock to an undeformed shape
6. waves of energy that travel through Earth
7. instrument that records seismic waves
9. area where no direct seismic waves from a particular earthquake can be detected
10. areas along a fault where relatively few earthquakes have occurred
12. place within the Earth where the speed of seismic waves increases sharply
A Variety of Volcanoes

Complete this worksheet after you finish reading Chapter 8, Section 2.

Volcanoes form due to a buildup of rock around a vent. Each of the boxes below represents one of the three types of volcanoes—shield, cinder cone, and composite. Determine which type of volcano is being described by the notes at left and write the note in the appropriate box.

- also known as stratovolcanoes
- built entirely out of pyroclastic material
- sides have a gentle slope
- often found in clusters
- have broad bases and summits with steep sides
- have only nonexplosive eruptions
- built entirely out of runny lava
- erode very quickly
- formed by explosive eruptions that are followed by lava outpourings

**Composite volcano**
- also known as stratovolcanoes
- have broad bases and summits with steep sides
- formed by explosive eruptions that are followed by lava outpourings

**Shield volcano**
- sides have a gentle slope
- have only nonexplosive eruptions
- built entirely out of runny lava
- erode very quickly

**Cinder cone volcano**
- built entirely out of pyroclastic material
- often found in clusters
- erode very quickly
CHAPTER 8
REINFORCEMENT WORKSHEET

Tectonic Plate Movement

Complete this worksheet after you have finished reading Chapter 8, Section 3.

1. Two simple models of tectonic plates are shown below. Each rectangle represents a tectonic plate. Draw a sketch below each model that shows how the two plates will look after they have moved over a period of time. Be sure to indicate where the magma forms.

   **Divergent boundary**
   ![Divergent boundary diagram]
   **Convergent boundary**
   ![Convergent boundary diagram]

2. Briefly explain why there is usually volcanic activity when the two plates move at a divergent boundary.

   A rift forms between the diverging plates. Mantle rock rises to fill this rift. Lower pressure at the rift causes the rock to melt and become magma. Lower-density magma rises up through the higher-density crust, and volcanic activity occurs.

3. Explain why there is usually volcanic activity when the two plates move at a convergent boundary.

   When the plates collide, one plate moves under the other. The rock of the descending plate begins to melt as the plate sinks deeper. The melted rock rises to the surface, and volcanic activity occurs.
Complete this puzzle after you finish Chapter 8.

Use the hints below to fill in the missing letters in the volcano puzzle on the next page. All of the words are spelled horizontally.

1. Magma that erupts and flows onto the Earth’s surface
2. A deep crack formed by diverging tectonic plates
3. A hole in the Earth’s crust
4. Hot liquid that forms when rock melts
5. A funnel-shaped pit around the central vent of a volcano
6. Small volcanic cones made entirely of pyroclastic material
7. A volcano built out of layers of lava from repeated nonexplosive eruptions
9. Formed when a magma chamber empties and its roof collapses
10. One or more vents and the lava or pyroclastic material that they have spewed onto the Earth’s surface
11. A stratovolcano
12. ________ material consists of erupted magma that solidifies as it travels through the air.
Complete this worksheet after you have finished reading Chapter 9, Section 2. Beneath the description, write the process that is taking place. (conduction, convection, or radiation)

1. One heater located in the deep end warms Carlos’s entire swimming pool.
   - convection

2. The sunlight shines directly on Janet’s desk but not on Carlos’s desk. Both Janet and Carlos are near the window, yet Janet feels much warmer than Carlos.
   - radiation

3. Carlos places a spoon in a steaming hot bowl of soup. Minutes later, the hot handle burns his fingers.
   - conduction
4. Carlos licks a juice pop that he has just removed from the freezer. The tip of his tongue freezes and sticks to the icy-cold treat. 

       conduction

5. When Janet sits near the campfire, her face feels hot even though her back feels cold.

       radiation

6. When Janet wins first place in the science-fair competition, Carlos shakes her hand. Her hand feels cold to him.

       conduction

7. Bubbles of liquid in Carlos's lava lamp are heated at the lamp's base. The bubbles then rise to the top. They fall after being cooled.

       convection
CHAPTER 9  
VOCABULARY REVIEW WORKSHEET

Riddle Me This

After completing Chapter 9, give this puzzle a try!

Using each of the clues below, fill in the letters of the word or phrase being described in the blanks provided on the next page. Then read the words in the vertical box to discover the answer to the following riddle: What do you call a feline unhappy about the excessive thermal energy beneath its feet?

1. the reason a spoon gets hot when it is in a bowl of hot soup
2. the conversion of a substance from one physical form to another
3. the energy needed to change the temperature of 1 kg of a substance by 1°C
4. the Earth’s atmosphere trapping thermal energy radiated by the sun
5. the transfer of thermal energy by the movement of a liquid or gas
6. the measure of the total kinetic energy of the particles in a substance
7. the transfer of energy between objects that are at different temperatures
8. excessive heating of a body of water
9. a material that conducts thermal energy well
10. a machine that uses heat to do work
11. the increase in the volume of a substance due to an increase in temperature
12. the transfer of thermal energy through matter or space as electromagnetic waves
13. the measure of the average kinetic energy of the particles in an object
14. a material that conducts thermal energy poorly
15. the lowest temperature on the Kelvin scale
16. solid, liquid, and gas
Riddle Me This, continued

1. **Conduction**

2. **Change of State**

3. **Specific Heat Capacity**

4. **Greenhouse Effect**

5. **Convection**

6. **Thermal Energy**

7. **Heat**

8. **Thermal Pollution**

9. **Conductor**

10. **Heat Engine**

11. **Thermal Expansion**

12. **Radiation**

13. **Temperature**

14. **Insulator**

15. **Absolute Zero**

16. **States of Matter**
1. Sketch and label the following features using different colors:
   a. the Mississippi River and its major tributaries
   b. the Mississippi River drainage basin
   c. the Continental Divide
   d. the Mississippi Delta
   e. the Rocky Mountains

2. Why do you think the Continental Divide is located where it is?
   A divide must be on higher ground than the drainage basins that it separates. The Rocky Mountains are the highest point west of the Mississippi River drainage basin.

3. The term delta comes from the Greek letter for D. The symbol for capital delta is $\Delta$. Why do you think the name for this symbol is used to describe such a formation?
   The Greek letter delta is shaped like a triangle, and the shape of a delta is also triangular.
Imagine that you are living in a frontier town called Dustville in the Wild West. It is 1905, and there is no available running water. All of Dustville’s water must be drawn from a well or found in springs. The mayor of Dustville has asked you to survey the land and drill a well for the town. In the illustration below, choose a good spot for a well, and indicate how deep the hole should be drilled. Remember to choose wisely because the whole town is counting on you.

Why did you choose to locate your well at this point? Use terms from the chapter to explain your answer.

Sample answer: I chose that location for the town’s well because it is the area closest to town that has a lowered elevation. The lower the elevation, the less we have to dig to get to the water table. I chose to dig the well deep enough to reach below the dry-season water table, so the well won’t dry up when we have a drought.
CHAPTER 10 VOCABULARY REVIEW WORKSHEET

A Freshwater Puzzle

After finishing Chapter 10, give this puzzle a try!

ACROSS
1. Process by which material is dropped or settles
4. ________ topography is associated with ground-water erosion.
7. A rock layer that stores and allows the flow of ground water
8. Change in elevation, divided by distance
9. Rocks and soil recently deposited by a river
13. A rock’s ability to allow water to pass through
16. The Nile ________ is a fan-shaped mud deposit at the mouth of the Nile River.
18. The path that a stream follows
19. Volume of water transported by a stream in a given amount of time
20. The water ________ is the continuous movement of water from lakes and oceans into the air, onto land, into the ground, and back to lakes and oceans.

DOWN
2. A river causes ________ by removing rocks and soil from its riverbed.
3. A flood ________ is the surrounding land that can become flooded when a stream overflows its banks.
5. ________ springs form where pressurized water flows through cracks in cap rock.
6. The underground boundary where the zones of aeration and saturation meet
8. The water in rocks below Earth’s surface is called ________ water.
10. Homeowners in some communities use ________ tanks to collect and clean their waste water.
11. Drainage basins are separated from each other by an area of higher ground called a ________.
A Freshwater Puzzle, continued

12. A ______ basin is an area drained by a river system.


15. A small river that flows into a larger river

17. Materials carried in a stream’s water

DEPOSITION

R

PO

KARST

LS

RAQUIFER

GRADIENT

B

ROE

ALLUVIUM

ONSE

ID

NPERMEABILITY

R

DAPPNAVRIA

TTII

IUDBN

CREE

DELTATG

OHANNEL

DISCHARGER

D

CYCLE
Imagine that you are an ecologist cataloging the interactions in a salt-marsh community. Look at the illustration of some of the organisms that live in a salt marsh, and draw arrows between them to indicate how energy flows between organisms in this ecosystem.

The Salt-Marsh Ecosystem

1. What producer(s) is shown above?
   Cordgrass is the producer shown above.

2. What carnivore(s) is shown above?
   The seaside sparrow is the carnivore shown above.

3. What omnivore(s) is shown above?
   The marsh crab is the omnivore shown above.
Complete this worksheet after you finish reading Chapter 12, Section 3.

In the space provided, indicate whether each of the following symbiotic relationships is an example of mutualism, commensalism, or parasitism.

1. Clownfish live among the poisonous tentacles of a sea anemone. The clownfish are protected from predators, and they keep the sea anemone clean.
   - mutualism

2. Barnacles attach themselves to the shells of crabs. The barnacles receive a home and transportation.
   - commensalism

3. Bees use a flower's nectar for food, and they carry a flower's pollen to other flowers, allowing the flowers to reproduce.
   - mutualism

4. Dutch elm disease has caused mass destruction of elms. The fungus feeds on materials produced by the elm trees.
   - parasitism

5. Orchids grow in tree branches. The orchids receive light, and their roots get water from the air.
   - commensalism

6. Small mites live on your skin, eating dead skin cells.
   - commensalism

7. Lichens are composed of a fungus and an alga. The alga makes food through photosynthesis, and this food is used by the fungus and the alga. The fungus absorbs nutrients from the environment that are used by the fungus and the alga.
   - mutualism

8. Tapeworms live in the intestines of cats, where they absorb nutrients from the food the cats eat.
   - parasitism
Environmental Enigma

Try this puzzle after you finish Chapter 12.

Using each of the clues below, fill in the letters of the word or phrase being described in the blanks provided on the next page.

1. a symbiotic relationship in which both organisms benefit
2. the study of the interactions between organisms and their environment
3. long-term change that takes place in two species because of their close interactions with each other
4. a group of individuals of the same species that live together in the same area at the same time
5. the environment where an organism lives
6. a consumer that eats animals
7. nonliving factors in the environment
8. symbiotic relationship in which one organism benefits and the other is not affected
9. an animal that feeds on the bodies of dead animals
10. two or more individuals or populations trying to use the same limited resource
11. diagram that represents how energy in food molecules flows from one organism to the next
12. consumer that eats a variety of organisms, both plants and animals
13. an organism that eats producers or other organisms for energy
14. triangle-shaped diagram that shows the loss of energy at each level of a food chain
15. the part of the Earth where life exists
16. living factors in the environment
17. an organism's way of life within an ecosystem
18. symbiotic relationship in which one organism benefits while the other is harmed
19. diagram that represents the many energy pathways in a real ecosystem
20. a consumer that eats plants
21. an organism that eats other organisms, called prey
22. an organism that gets energy by breaking down the remains of dead organisms
23. a community of organisms and their nonliving environment
Environmental Enigma, continued

1. **MUTUALISM**
2. **ECOLOGY**
3. **COEVOLUTION**

4. **POPULATION**
5. **HABITAT**
6. **CARNIVORE**
7. **ABIOTIC**
8. **COMMENSALISM**
9. **SCAVERNGER**

10. **COMPETITION**
11. **FOOD CHAIN**
12. **OMNIVORE**
13. **CONSUMER**
14. **ENERGY PYRAMID**
15. **BIOSPHERE**

16. **BIOTIC**
17. **NICHE**
18. **PARASITISM**
19. **FOOD WEB**
20. **HERBIVORE**
21. **PREDATOR**
22. **DECOMPOSER**
23. **ECOSYSTEM**
Complete the worksheet after you have finished reading Chapter 13, Section 3. Look at this illustration of an ocean environment, and answer the questions below.

1. Label the following zones of the benthic environment on the illustration.
   - intertidal zone
   - bathyal zone
   - sublittoral zone
   - abyssal zone

2. Label the following zones of the pelagic environment on the illustration.
   - neritic zone
   - oceanic zone

3. Why do you think the dolphin was placed at that particular spot in the illustration?

   Accept any reasonable answer. Sample answers: The dolphin is near the surface so it can get air to breathe. The dolphin was placed in the neritic zone because there is plenty of food in this zone.

4. Add the following organisms to the illustration by cutting them out and pasting them in the appropriate zones.
CHAPTER 13
REINFORCEMENT WORKSHEET

The Oceans and Us

Complete this worksheet after you read Chapter 13, Section 5.

1. The diagram below will help you put together the ideas from this chapter. It shows how humans interact with the ocean in both positive and harmful ways. Complete the diagram by reviewing the appropriate sections of the chapter. On each of the blank lines, fill in one or two words that are appropriate.

Answers may vary. Sample answers:

- **Exploring and studying**: Sonar, Submarines, Satellites
- **Living resources**: Fishing, Fish farms
- **Saving resources**: Cleaning beaches, Laws
- **Nonliving resources**: Desalinated water, Minerals, Oil and natural gas
- **Creating energy**: Tidal energy, Wave energy
- **Pollution**: Oil spills, Waste water, Trash, Sludge

2. Use the completed diagram to help you list positive and negative ways that humans interact with the oceans. Include at least four items in each list.

   **a. Positive effects:**
   - Sample answers: exploration with new technologies, creating energy, processing drinking water, getting food, cleaning up beaches, etc.

   **b. Harmful effects:**
   - Sample answers: pollution, trash dumping, oil dumping, depleting the fish supply, etc.
Give this puzzle a try after you finish Chapter 13.
Use the clues below to complete the crossword puzzle on the next page.

ACROSS
1. The zone that begins where the intertidal zone ends
3. The land under the ocean is divided into the deep-ocean basin and the _______ margin.
5. Zone of the benthic environment whose depth ranges from 200 to 4,000 m below sea level
6. Underwater mountain of volcanic material
7. The base of the continental slope is called the continental _______.
9. The steepest part of the continental margin is called the continental _______.
10. The flattest part of the continental margin is called the continental _______.
13. Water that falls to Earth as rain or snow
17. The deepest zone of the benthic environment
19. The water _______ includes evaporation, condensation, and precipitation.
20. The _______ zone includes the water that covers the continental shelf.
22. Removing salt from sea water
23. The broad, flat portion of the deep-ocean basin that is covered by ooze is called the abyssal _______.

DOWN
2. Organisms that live in mud, sand, and rock on the ocean floor
4. The shallowest benthic zone
8. The benthic _______ is the ocean floor and all the organisms that live on it or in it.
9. The measure of the amount of dissolved solids in a given amount of liquid
11. Swimming marine organisms
12. Almost three quarters of the Earth's surface is covered with _______.
13. The water in the ocean and the organisms that live above the ocean floor make up the _______ environment.
14. Most of Earth’s water is found in the _______.
15. The deepest place on the Earth’s surface is in an oceanic _______.
16. Microscopic organisms that float in surface waters
18. The zone in the benthic environment that contains black smokers and tube worms is called the _______ zone.
21. A _______ valley can be found on the ocean floor.

<table>
<thead>
<tr>
<th></th>
<th>S U B L I T T O R A L</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>5</td>
<td>B A T H Y A L</td>
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<td>S E A M O U N T</td>
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<td>R I S E</td>
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<td>9</td>
<td>S H E L F</td>
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<td>P R E C I P I T A T I O N</td>
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<td>22</td>
<td>D E S A L I N A T I O N</td>
</tr>
<tr>
<td>23</td>
<td>P L A I N</td>
</tr>
</tbody>
</table>
Complete this worksheet after you finish reading Chapter 14, Section 2.

Your pen pal, Hannah, lives in the desert of Tucson, Arizona. In her last letter, Hannah wrote that she will be visiting the beach for the first time during a family vacation to California. She said she was excited about her trip but needs you to help her out with something. Since Hannah’s class hasn’t studied the ocean yet, she was wondering if you would share with her what you know about it. She mentioned that she was particularly curious about the waves.

First match the terms and definitions below, and then use this information to write Hannah a letter explaining what you know. Be sure to include any diagrams that might help explain things more clearly!

- a. an area near the shore where waves begin to tumble downward, or break
- b. the vertical distance between a wave’s crest and its trough
- c. rolling waves that move across the ocean in a steady procession and that form from calm winds
- d. the lowest point of a wave
- e. the time it takes for two waves to pass a fixed point
- f. the distance between two adjacent wave troughs or wave crests
- g. an area between the breaker zone and the shore
- h. the highest point of a wave
- i. waves that are foamy with steep crests and that break in the open ocean; form during stormy weather
Dear Hannah,

Sample answer: It is pretty funny that you asked me about the beach because we just finished a chapter about the movement of ocean water! This chapter included an entire section on waves. I think the best way for me to help you understand some of the terms I learned is to draw you a picture and label the different parts. Take a look at my picture. As you can see, these terms describe the anatomy of a wave.

Obviously, waves can be different sizes and can travel at different speeds. The time it takes for two waves to pass a fixed point is called the wave period. If you stand on the beach and look at the waves rolling into the shore, you will see that there is an area where the waves begin to tumble downward, or break. This area is known as the breaker zone. As they move away from the breaker zone to the shore, the waves will continue to break. The area between the breaker zone and the shore is called the surf. If you go out into the open ocean in a boat, you might see a type of wave called swells. Swells are formed from calm winds, and they roll across the ocean water in a steady fashion. A different type of wave, one I hope you don’t see, is called a whitecap. Whitecaps form when the weather gets stormy, and they have very steep crests. They are white and foamy, and they break in the open ocean before they get close to the shore. I hope you have a good time in California. Be sure to send me a picture of you on the beach!

Your friend, _____________________________
Dear Hannah,

It’s great that you will be visiting the beach for the first time! Did you know that the level of the ocean’s surface changes daily? These changes, called **tides**, are influenced by the **moon** and the **sun**. The gravity of the **moon** has a more noticeable pull on liquids than on solids because liquids move more easily. The side of the Earth that is facing the moon experiences the strongest pull. The pull forces ocean water to bulge, creating a **high tide**. Even an ocean facing away from the moon bulges because of the way the Earth and moon are moving around each other. Water is pulled into the bulges from the areas between the high tides, creating a **low tide** in each area. An especially strong tide, called a **spring tide**, occurs during the new and full moons when the sun, Earth, and moon are aligned. But when the sun, Earth, and moon form a 90-degree angle, high and low tides don’t vary as much, and a **neap tide** occurs. The last type of water movement I remember learning about has a strange name. A **tidal bore** occurs in estuaries, bays, or other narrow coastal **inlets**. When the high tide comes in, water rushes into these areas and causes a sudden rise in the water level.

I hope you find this information useful. It definitely made me take a second look at the ocean!

Your friend,
### Vocabulary Review Worksheet

#### Seafaring Game Show

**After you finish Chapter 14, give this puzzle a try!**

This game may be played individually or in teams. You are supplied with the answers to questions in four categories. Your challenge is to come up with the correct question for each answer. Each correct “question” has a point value corresponding to the number at the beginning of the row. Keep a running total of your points as you play.

<table>
<thead>
<tr>
<th>Basic anatomy</th>
<th>Surf’s up</th>
<th>Tide you over</th>
<th>A current affair</th>
<th>Total points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal distance between the high point of the ocean’s surface</td>
<td>White, foaming waves with steep crests that break in the open ocean</td>
<td>Daily movements of ocean water that change the level of the ocean’s surface</td>
<td>Streamlike movements of ocean water far below the surface</td>
<td><strong>Pts.</strong></td>
</tr>
<tr>
<td>What is a wavelength?</td>
<td>What are whitecaps?</td>
<td>What are tides?</td>
<td>What are deep currents?</td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>Vertical distance between the high and low point of a wave</td>
<td>The area near shore where waves first begin to tumble downward</td>
<td>The difference between levels of ocean water at high and low tide</td>
<td>The Gulf Stream, for example</td>
<td><strong>200</strong></td>
</tr>
<tr>
<td>What is a wave height?</td>
<td>What is the breaker zone?</td>
<td>What is a tidal range?</td>
<td>What is the Coriolis effect?</td>
<td><strong>300</strong></td>
</tr>
<tr>
<td>The highest point of a wave</td>
<td>Rolling waves that move in a steady procession across the ocean</td>
<td>The time it takes for two waves to pass a fixed point</td>
<td>Tides caused by the alignment of the sun, Earth, and moon</td>
<td><strong>400</strong></td>
</tr>
<tr>
<td>What is a crest?</td>
<td>What are swells?</td>
<td>What is a wave period?</td>
<td>What are spring tides?</td>
<td><strong>500</strong></td>
</tr>
<tr>
<td>The lowest point of a wave</td>
<td>A wave that can be caused by earthquakes or volcanic eruptions</td>
<td>What is a storm surge?</td>
<td>What are neap tides?</td>
<td><strong>Total points: __________________</strong></td>
</tr>
<tr>
<td>What is a trough?</td>
<td>A local rise in sea level near the shore caused by strong winds from storms</td>
<td>What is a tidal bore?</td>
<td>Occur as high tides rise in narrow coastal inlets</td>
<td><strong>Tide you over</strong></td>
</tr>
<tr>
<td>What is a wave?</td>
<td>A tidal rise caused by strong winds from storms</td>
<td>What is a storm surge?</td>
<td>What is a tsunami?</td>
<td><strong>A current affair</strong></td>
</tr>
<tr>
<td>What is upwelling?</td>
<td>What is a wave period?</td>
<td>What is a storm surge?</td>
<td>What is a surface current?</td>
<td><strong>Total points: __________________</strong></td>
</tr>
</tbody>
</table>

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Complete this worksheet after you finish reading Chapter 15, Section 1.

The Earth's atmosphere is divided into four layers. Choose the layer in Column B that best matches the description in Column A, and write your answer in the space provided. Then, use the directions below to label the diagram of the Earth's atmosphere on the next page.

### Column A

1. the layer of the Earth's atmosphere that you live in
2. the coldest layer of the Earth's atmosphere; lies directly below the uppermost layer
3. the uppermost layer of the atmosphere
4. the layer that contains most of the atmosphere's ozone; above the layer that you live in

### Column B

a. troposphere
b. stratosphere
c. mesosphere
d. thermosphere

---

5. Label the four layers of the atmosphere on the diagram on the next page.

6. There is no clear boundary between the uppermost layer of the atmosphere and space. The atmosphere becomes thinner and thinner and blends into space. At the very top of the diagram, write the word space with an arrow pointing up.

7. The ozone layer is in the upper part of the atmospheric layer that contains most of the atmosphere's ozone. Use the symbol for ozone to draw in the ozone layer on the diagram.

8. The ozone layer is important because it absorbs ultraviolet radiation. Draw a wavy line coming from space to represent the UV radiation that is absorbed by the ozone layer.

9. The thermosphere contains ions, which are electrically charged particles. When nitrogen and oxygen atoms absorb solar energy, they become ions. Draw the ions in the thermosphere. Remember that the thermosphere is very thin and that there are almost no ions near the top of the thermosphere.

10. The troposphere is the densest layer of the atmosphere. It is much denser than the other layers. Shade this layer heavily to indicate how dense it is.

11. The stratosphere is very thin. Shade this layer lightly.

12. The mesosphere is even less dense than the stratosphere. Shade this layer very lightly.
Earth’s Amazing Atmosphere, continued

Key

- Density
- Ozone
- Ions
- UV radiation

Altitude

- 80 km
- 50 km
- 16 km
- 0 km

Layers:
- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere

UV radiation from the sun is absorbed in the ozone layer, protecting life on Earth from harmful UV radiation.
After you finish reading Chapter 15, try this crossword puzzle!

Use the clues below to complete the crossword puzzle on the next page.

**ACROSS**

2. atmospheric layer above the troposphere
6. height of an object above the Earth’s surface
7. the coldest layer of the atmosphere
8. pollutants such as ozone or smog
11. the effect that causes objects to move in a curved direction due to the Earth’s rotation
12. a device used to remove pollutants from smokestacks
15. wind belts that extend from the poles to 60° latitude
18. molecule made up of three oxygen atoms
20. moving air
21. pollutants in the air because of human activity
22. the effect in which gases in the atmosphere convert absorbed radiation into heat
23. heat transfer from one material to another by direct contact

**DOWN**

1. narrow belts of high-speed winds
3. winds that blow from 30° latitude to the equator
4. the uppermost atmospheric layer
5. mixture of gases that surrounds the Earth
9. the measure of the force with which the air molecules are pushing on a surface
10. a rise in average global temperatures
13. movement of heat by a liquid or gas
14. global winds found between 30° and 60° latitude
16. damaging precipitation caused by oxides of sulfur and nitrogen
17. the layer of the atmosphere where we live
19. energy that travels in waves
In the Air, continued

Crossword Puzzle

1. J E
2. S T R A T O S P H E R E
3. O
4. T
5. A S
6. T A L T I T U D E
7. M E S O S P H E R E D
8. E S E C O N D A R Y
9. M
10. I G O
11. C O R I O L I S
12. S C R U B B E R
13. C
14. E A E
15. P O L A R
16. P E A S T R I L I E S
17. L R
18. O Z O N E U A
19. W I N D
20. R R R
21. P R I M A R Y N I
22. G R E E N H O U S E I
23. C O N D U C T I O N
Precipitation Situations

Complete this worksheet after you have finished reading Chapter 16, Section 3.

The table below will help you to compare and contrast the different types of severe storms. Fill in the table according to the directions.

1. Describe the conditions under which each storm is most likely to occur. Name the regions where these storms occur most frequently.

2. Describe how each storm forms.

3. In two sentences describe a possible aftermath of a severe occurrence of each type of storm.

<table>
<thead>
<tr>
<th>Conditions/Region</th>
<th>Formation</th>
<th>Aftermath</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hailstorm</strong></td>
<td>Sample answer: They occur most often in spring and summer. They can occur anywhere there is warm weather.</td>
<td>Sample answer: Updrafts of air in the clouds carry raindrops to high altitudes, where they freeze. As they fall, they collect more water and grow in size.</td>
</tr>
<tr>
<td><strong>Thunderstorm</strong></td>
<td>Sample answer: Thunderstorms occur in any climate where the air near Earth's surface is warm and moist. These storms can occur anywhere in the world.</td>
<td>Sample answer: Warm, moist air rises rapidly in an unstable atmosphere.</td>
</tr>
<tr>
<td>Conditions/Region</td>
<td>Formation</td>
<td>Aftermath</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Tornado</strong></td>
<td>Sample answer: During a thunderstorm, winds traveling in two different directions form a funnel cloud that can move to the ground.</td>
<td>Sample answer: The path cut by the tornado is cleared of trees. On either side of the path are fallen trees, overturned cars, and roofless houses.</td>
</tr>
<tr>
<td><strong>Hurricane</strong></td>
<td>Sample answer: Hurricanes form in tropical climates. They form between 5° and 20° north and south latitude over warm, tropical oceans.</td>
<td>Sample answer: Trees and telephone poles are bent over or broken off. People are rowing boats through flooded streets.</td>
</tr>
</tbody>
</table>

Sample answer: Thunderstorms move over tropical waters. Winds traveling from two directions collide and rotate over an area of low pressure.
Weather Puzzle

After completing Chapter 16, give this puzzle a try!
Use the clues below to complete the crossword puzzle on the next page.

ACROSS
1. Weather that can cause property damage and even deaths
4. Weather map symbol representing a weather station
6. Puffy white clouds with flat bottoms
8. Amount of moisture the air contains compared with the maximum amount it can hold at a particular temperature
9. Funnel cloud that touches the ground
12. Continuous movement of water from water sources to the air, to the ground, and back to water sources
13. Mercury-filled glass tube used to measure air temperature
15. Cone-shaped cloth bag open at both ends for measuring wind direction
17. Used to measure relative humidity
19. Sound that results from the rapid expansion of air along a lightning strike
20. Water in solid or liquid form that falls from the air to the Earth
22. Temperature at which air is fully saturated
23. Mercury-filled glass tube used to measure air pressure
26. When liquid water changes into water vapor
27. Process by which plants release water vapor into the air through their leaves
29. Freezing rain
30. Small, intense weather system that produces strong winds, heavy rain, lightning, and thunder

DOWN
2. Prediction of weather conditions
3. Large body of air that has similar temperature and moisture throughout
5. Boundary between two air masses
6. When water vapor becomes a liquid
7. Collection of millions of tiny water droplets or ice crystals
10. Rotating cups that measure wind speed
11. Clouds that form in layers
14. Large, rotating tropical weather system with high-speed winds
16. Amount of moisture in the air
18. Tool shaped like an arrow that indicates wind direction
21. Thin, feathery clouds at high altitudes
24. Solid precipitation that falls as balls or lumps of ice
25. Most common form of solid precipitation
28. Water from precipitation that flows across land and collects in rivers and streams
Complete this worksheet after you have finished reading Chapter 17, Section 2.

Below is a map of the Western Hemisphere. Follow the directions at the bottom of the page to label the map. Then use the map to answer the questions on the next page.

1. Label the tropic of Cancer and the tropic of Capricorn on the map. (Hint: They are already drawn for you. The tropic of Capricorn is south of the equator.)

2. The tropical zone lies between the tropic of Capricorn and the tropic of Cancer. Label the tropical zone on the map.

3. The polar zone lies above 66.5°N and below 66.5°S. Label the polar zone on the map.

4. The temperate zone is the zone between the polar and tropical zones. Label the temperate zone on the map.
Look at the table below. The three cities listed in the table are shown on the map on the previous page. For each city, label the appropriate climate zone. Then complete the table by writing the notes listed at the bottom of this page in the appropriate spaces in the table. Some of the notes will be used more than once. You may want to review the material on latitude in Section 1 of your text to help you with this exercise.

**A Tale of Three Climates, continued**

How Latitude Affects the Seasons

<table>
<thead>
<tr>
<th>City and climate zone</th>
<th>December 31</th>
<th>June 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrow, Alaska</td>
<td>winter</td>
<td>summer</td>
</tr>
<tr>
<td></td>
<td>almost 24 hours of night</td>
<td>almost 24 hours of day</td>
</tr>
<tr>
<td>Quito, Ecuador</td>
<td>not much seasonal change</td>
<td>not much seasonal change</td>
</tr>
<tr>
<td></td>
<td>about the same length of day and night</td>
<td>about the same length of day and night</td>
</tr>
<tr>
<td>Santiago, Chile</td>
<td>summer</td>
<td>winter</td>
</tr>
<tr>
<td></td>
<td>day is longer than night</td>
<td>night is longer than day</td>
</tr>
</tbody>
</table>

**Notes**

- summer
- winter
- not much seasonal change
- almost 24 hours of night
- about the same length of day and night
- night is longer than day
- day is longer than night
After you finish learning about climate in Chapter 17, give this worksheet a try!

Rocky and Rudolph are imaginary travelers through time and space. They keep a journal of their trips, but they usually forget to take an Earth science dictionary with them, so they leave some words blank. Read about their latest adventures, and fill in the blank spaces with the vocabulary words listed on the next page.

Day One

The __________ weather __________ today is so hot and humid where we live that we have decided to go back in time 2 million years, to the beginning of the most recent __________ ice age __________. During this glacial period, enormous sheets of ice advanced across the continents toward the equator. Many of the Earth’s __________ climates __________ were much colder then than they are now, so we should be guaranteed some cool temperatures.

Day Two

Today we’re going to tour some of the Earth’s __________ biomes __________, large regions that are characterized by specific climates, plants, and animals.

First we’ll go to the equator, which is at 0° __________ latitude __________. The equator is in the __________ tropical __________ zone because it is located between the tropic of Capricorn and the tropic of Cancer. This zone has the highest average temperatures on Earth, so we might visit a mountain while we’re there. After all, temperature decreases as __________ elevation __________ increases. And who knows? We may find a __________ microclimate __________ on the mountain that has characteristics different from those found in the areas around the mountain.
Then we'll visit the _______________ polar zone, which has the coldest average temperatures on Earth. This might be a lot like our trip back in time to see the glaciers!

Last but not least, we'll visit the _______________ temperate zone, which has moderate temperatures. We plan to visit the forests in this zone. Rocky wants to see _______________ evergreen trees, which keep their leaves all year long, and I want to see _______________ deciduous trees, which lose their leaves during the winter.

**Day Three**

This trip will be into the future to see the effects of _______________ global warming on the Earth. We might see shrunken coastlines and crop failures in the Midwest. Scientists think that this rise in global temperatures is caused by the _______________ greenhouse effect, in which gases such as carbon dioxide trap heat in the Earth’s atmosphere.

Rocky wants to take the sailboat out for a spin. We will try to hit a region where the _______________ prevailing winds blow in the same direction that the ocean’s _______________ surface currents move so that we can sail at maximum speed. I just want to be sure that we don’t forget the sunscreen!

**Vocabulary Words**

- biomes
- temperate
- global warming
- climates
- elevation
- surface currents
- deciduous
- polar
- greenhouse effect
- latitude
- weather
- prevailing winds
- ice age
- microclimate
- evergreen
- tropical