

Scott Foresman - Addison Wesley

ENVIRONMENTAL SCIENCE



REVIEW WORKSHEETS



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CHAPTER 1

SECTION REVIEW 1.1

Complete the following.

1. What is the solar system? _____

2. How many planets are in the solar system? _____
3. Where is Earth located in the solar system? _____

4. What is the main difference between the inner planets and the outer planets? _____

5. Which of the planets in the solar system are known to support life? _____
6. Identify two important reasons why Earth is able to support life. Explain how each reason is important.
 - a. _____
 - b. _____
7. How does energy from the sun travel to the planets? _____

8. What is the visible spectrum? _____

9. What is the importance of the sun's energy to organisms? _____

10. Identify and describe the three main regions of Earth in which living things are found.
 - a. _____

 - b. _____

 - c. _____

11. What is ecology? _____



CHAPTER 1

SECTION REVIEW 1.2

Complete the following.

1. What are the three main types of rocks? Give an example of each.

a. _____

b. _____

c. _____

2. How are rocks classified? _____

3. Briefly describe how the three main types of rocks are formed.

a. _____

b. _____

c. _____



4. Why is Earth called the water planet? _____



5. What percent of Earth's water is salt water? _____

6. What percent of Earth's water is fresh water? _____

7. Where is Earth's salt water located? _____

8. Where is Earth's available fresh water located? _____

9. Why is most of Earth's fresh water not available to drink? _____

10. Name the two types of fresh water and give examples of each.

a. _____

b. _____

CHAPTER 1

SECTION REVIEW 1.3

Complete the following.

1. What is the atmosphere? _____

2. List the four main layers of Earth's atmosphere and their positions and thicknesses.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
3. What gases make up Earth's air and in what percentages? _____

4. Why is carbon dioxide important to life? _____

5. Which layer of the atmosphere is closest to Earth's surface? _____

6. List three things that are found in the troposphere.
 - a. _____
 - b. _____
 - c. _____
7. What is ozone? _____

8. Why is ozone important to living things? _____

9. What are auroras and in which layer of the atmosphere do they occur? _____



CHAPTER 1

SECTION REVIEW 1.4

Complete the following.

1. What is the biosphere? _____

2. How thick is the biosphere? _____

3. a. In what range of the biosphere does most life on Earth exist? _____

b. Why is life usually not found beyond this range? _____



4. List three materials that organisms obtain from the biosphere.

- a. _____
- b. _____
- c. _____



5. Describe some changes in the biosphere that can affect the organisms living in it. _____

6. Describe some changes that organisms can make to the biosphere. _____

CHAPTER 1

VOCABULARY REVIEW

PLANET EARTH

Match the correct vocabulary term to each of the numbered statements.

- | | | | |
|-----------------------|----------------------------|-------------------------|---------------------|
| A. organism | E. igneous rock | I. ozone | M. biosphere |
| B. lithosphere | F. stratosphere | J. troposphere | N. ecology |
| C. hydrosphere | G. sedimentary rock | K. aquifer | |
| D. atmosphere | H. metamorphic rock | L. artesian well | |

1. ____ A layer of gas contained in the upper atmosphere.
2. ____ The layer of the atmosphere in which most weather occurs.
3. ____ The part of Earth from the ocean floor to the highest mountain tops.
4. ____ A geologic feature in which water flows to Earth's surface due to high pressure underground.
5. ____ The atmospheric layer directly below the mesosphere.
6. ____ Rocks that were formed from melted rocks.
7. ____ A layer of porous rock that holds water.
8. ____ Rock that was changed from one type to another by pressure and heat.
9. ____ Any living thing.
10. ____ The study of the interactions among nonliving and living parts of Earth.
11. ____ The soil, mountains, and oceanic crust.
12. ____ An envelope of gases surrounding Earth.
13. ____ Rocks made of accumulated particles that were carried by water or wind.
14. ____ The part of Earth that is made of water.



CHAPTER 2

SECTION REVIEW 2.1

Complete the following.

1. What is science? _____

2. Explain why science involves a great deal of uncertainty. _____

3. What is a hypothesis? _____



4. What might cause a scientist to change a hypothesis? _____



5. What caused scientists to change their ideas about cellular structures? _____

6. Name some challenges for scientists today. _____

7. Why is it important to be knowledgeable about issues in science? _____

CHAPTER 2

SECTION REVIEW 2.2

Complete the following.

1. Why might flexibility and open-mindedness be desirable qualities in a scientist? _____

2. Every investigation begins with a(n) _____

3. List two ways in which observations are made. _____



4. Name three examples of tools used by scientists. _____



5. Why might a scientist repeat the work already done by others? _____

6. Briefly describe the process of developing a hypothesis. _____

7. What is a prediction? _____

8. When is a hypothesis considered to be valid? _____

9. What is a variable? _____

10. Name two ways that scientists represent the data collected in an experiment. _____

CHAPTER 2

SECTION REVIEW 2.3

Complete the following.

1. What is environmental science? _____

2. Why is it important that people study the environment? _____

3. Which fields of science are used in environmental science? _____



4. Give five examples of biotic factors. _____



5. Give five examples of abiotic factors. _____

6. a. What were some effects of hunting natural deer predators in the northern Grand Canyon area of Arizona in the early 1900s? _____

b. What does this tell you about environmental interactions and change? _____

7. What are some possible impacts of public policy decisions concerning the environment? _____

CHAPTER 3

SECTION REVIEW 3.1

Complete the following.

1. How old is Earth? _____

2. What are tectonic plates? _____

3. How may earthquakes occur? _____

4. Name two things that cause changes in the lithosphere. _____

5. Name two changes that occur in the hydrosphere on a cyclical basis. _____

6. How do glaciers shape the land? _____

7. What is El Niño? _____

8. Describe some ways in which organisms change the atmosphere. _____

9. How can volcanic eruptions change the atmosphere? _____



CHAPTER 3

SECTION REVIEW 3.2

Complete the following.

1. What needs do all organisms have in common? _____

2. The amount of _____ on an area of land directly affects the abundance of life in that area.
3. What factors affect water quality? _____

4. The process by which plants make food is called _____.
5. What essential substances do organisms need from food?



6. How can poisons in the environment pass from one organism to another? _____



7. Why do organisms require space? _____

8. What are territorial animals? Give an example of one. _____

9. Why are birds and mammals able to tolerate a wider range of temperatures than other kinds of animals?

10. What happens during hibernation? _____

CHAPTER 3

SECTION REVIEW 3.3

Complete the following.

1. Why might members of a species compete with one another? _____

2. What is a habitat and what does it provide? _____

3. Name three examples of habitats.

- a. _____
- b. _____
- c. _____



4. Explain how habitat destruction reduces the range of a species in a particular region.



5. Ecologically speaking, which is bigger, a population or a community? Explain. _____

6. The variety of species in an ecosystem is known as _____.

7. What effect might destruction of a habitat have on biodiversity in the local ecosystem?

CHAPTER 3

VOCABULARY REVIEW

CHANGE IN THE BIOSPHERE

Match the correct vocabulary term to each of the numbered statements.

- | | | | |
|---------------------------|-----------------------|------------------------------|---------------------------------|
| A. biodiversity | E. species | I. dormant | M. ecosystem |
| B. El Niño | F. community | J. geographical range | N. the greenhouse effect |
| C. habitat | G. erosion | K. ice ages | O. nutrients |
| D. tectonic plates | H. hibernation | L. territory | P. population |

1. ____ The lithosphere is made up of large movable _____.
2. ____ The wearing away of land through _____ is one cause of present land formations.
3. ____ Two examples of large-scale variations in the hydrosphere over time are _____ and _____.
4. ____ When people burn organic matter, carbon dioxide gas is released into the atmosphere, influencing Earth's temperature in a process called _____.
5. ____ All the vitamins, minerals, and other chemicals that an organism requires from food are called _____.
6. ____ Space, a requirement of organisms, is sometimes claimed by specific animals in an area called a _____.
7. ____ Plants are said to be _____ when they lose their leaves and stop growing to survive periods of cold temperatures. Similarly, some animals enter a sleeplike state called _____.
8. ____ Organisms that can breed and produce fertile offspring are members of the same _____.
9. ____ A species' _____ is the environment in which its members live.
10. ____ Destruction of large areas of land have greatly reduced the _____ of many animals.
11. ____ All the members of a species in an area, such as all the dandelions in a field, make up a _____.
12. ____ A(n) _____ includes all the plants and animals that interact in the same environment.
13. ____ Included in a(n) _____ are all the organisms and abiotic factors of that area.
14. ____ The variety of species, or _____, of a community is reduced when habitats are destroyed.



UNIT REVIEW 1

STUDYING EARTH

- On a separate sheet of paper, construct a schematic illustration to show a way in which the three layers of Earth interact.
 - Where does the biosphere fit into your schematic illustration?

- Why is environmental science called an integrated science?

- List four reasons why an organism might make changes in its environment.

a. _____

b. _____

c. _____

d. _____

- On a separate sheet of paper, organize the following terms into a schematic of the structure of a typical ecosystem.

species, communities, populations, abiotic factors, ecosystem

- Give your own example of how a product of science has been a great benefit to the world.

- Give your own example of how a product of science has been a great harm to the world.

- What do the answers in questions 5.a. and 5.b. say about the responsibility of scientists and consumers?

- In your own words, describe the following:

a. igneous rock _____

b. aquifer _____

c. troposphere _____

d. metamorphic rock _____

- How is the lithosphere continually formed?



CHAPTER 4

SECTION REVIEW 4.1

Complete the following.

1. What is the main difference between a producer and a consumer? _____

2. Name a producer that lives on land. _____

3. Name a producer that lives in water. _____

4. How do consumers get their energy? _____



5. Name three examples of the following:

a. Herbivores: _____

b. Carnivores: _____

c. Decomposers: _____

6. What is the difference between a carnivore and a scavenger? _____

7. Explain the importance of decomposers to the ecosystem. _____

8. What is a trophic level? _____

9. Which trophic level is usually largest? _____

10. Define the terms autotroph and heterotroph.

a. _____

b. _____

CHAPTER 4

SECTION REVIEW 4.2

Complete the following.

1. What is common to all food chains? _____

2. Beginning with the producer, put the following organisms in order to form a food chain:
hawk, corn, wren, grasshopper

3. In the food chain that you just constructed, what might happen to the other organisms if the number of grasshoppers increased? _____



4. What might happen in this same food chain if the number of hawks decreased dramatically? _____



5. Explain why a diverse ecosystem is considered by ecologists to be stable. _____

6. An example of a stable ecosystem is a _____.

7. An example of an ecosystem that is not very stable is a _____.

8. What is biological magnification? _____

CHAPTER 4

SECTION REVIEW 4.3

Complete the following.

1. What percentage of the sunlight that reaches Earth is absorbed by plants? _____

2. What is biomass? _____

3. Why isn't all of the energy that enters organisms available to the next trophic level? _____



4. What three things are ecological pyramids used to represent? _____



5. From where is the energy in most ecosystems derived? _____

6. How does the energy, biomass, or population at each trophic level compare to that of the level below it? _____

7. Name the four elements that are essential to the growth of producers in ecosystems.

- a. _____
- b. _____
- c. _____
- d. _____

CHAPTER 4

SECTION REVIEW 4.4

Complete the following.

1. Give three examples of common elements existing in the atmosphere.
 - a. _____
 - b. _____
 - c. _____
2. What is the most common element in the atmosphere and what percentage of the atmosphere does it represent? _____

3. By weight, what percentage of the human body is made up of oxygen? _____
4. Name two ways in which water can enter the atmosphere.
 - a. _____
 - b. _____
5. Briefly describe the water cycle. _____

6. What is the source of energy that powers the water cycle? _____

7. What are three sources of carbon on Earth? _____

8. Describe how the nitrogen cycle works and why it is important to living organisms. _____



CHAPTER 4

VOCABULARY REVIEW

MATTER AND ENERGY IN THE ECOSYSTEM

Use the terms from the following list to answer the questions.

- | | | |
|-------------------------|----------------------|------------------------------------|
| A. transpiration | E. producers | I. biological magnification |
| B. legume | F. food chain | J. ecological pyramid |
| C. biomass | G. decomposer | K. trophic level |
| D. consumers | H. food web | L. evaporation |

1. ____ Method by which ocean or lake water enters the atmosphere.
2. ____ A term that describes the interrelationship of grass, mice, and snakes.
3. ____ A type of plant that plays a special role in the nitrogen cycle.
4. ____ Bacteria, fungi, and earthworms are some examples of this type of organism.
5. ____ This is used to show relative amounts of energy, organic matter, and numbers of organisms in an ecosystem.
6. ____ Organisms that cannot make their own food.
7. ____ The amount of organic matter present in a trophic level.
8. ____ Term describing the feeding relationships among the organisms in an ecosystem.
9. ____ Organisms that make up the base of an ecological pyramid.
10. ____ The increasing concentration of DDT at higher levels throughout the food chain is one example of this.
11. ____ Scientists use this term to refer to each of the different layers in the feeding relationships of organisms in an ecosystem.
12. ____ Method by which water from the leaves of plants enters the atmosphere.



CHAPTER 5

SECTION REVIEW 5.1

Complete the following.

1. What is a species' niche? _____

2. What factors help to define a niche? Give examples of each. _____

3. a. What prevents two different species from sharing the same niche? _____

b. What is the phenomenon described in 3.a. called? _____

4. Explain the difference between an organism's *fundamental* niche and its *realized* niche. _____

5. What is the role of predators in determining niche diversity? _____

6. Identify abiotic factors that contribute to niche diversity. _____



CHAPTER 5

SECTION REVIEW 5.2

1. What is evolution? _____

2. What is a specialized species? Give one example. _____



3. What is a generalized species? _____



4. Why are generalized species considered more adaptable to changes in the environment?

5. Provide an example of convergent evolution. _____

6. What is coevolution? _____

7. Provide an example of coevolution. _____

CHAPTER 5

SECTION REVIEW 5.3

Complete the following.

1. What prevents populations from continuously growing exponentially? _____

2. Define carrying capacity. _____

3. What happens to a population when it reaches carrying capacity? _____

4. Describe a population represented by an S-shaped growth curve. _____



5. Identify six factors that limit the growth of a population. Classify them into two categories.
Density-dependent factors

- a. _____
- b. _____
- c. _____

Density-independent factors

- d. _____
- e. _____
- f. _____

6. Give an example of a population that exhibits an S-shaped growth curve. _____

7. Give an example of a population that exhibits a boom-and-bust growth curve. _____

8. Why is the human population growing exponentially? _____



CHAPTER 5

VOCABULARY REVIEW

INTERACTIONS IN THE ECOSYSTEM

Match the correct vocabulary term to each of the numbered statements.

- | | | |
|---------------------------------|--------------------------------|--|
| A. niche | E. convergent evolution | I. density-dependent limiting factors |
| B. competitive exclusion | F. coevolution | |
| C. keystone predator | G. exponential growth | J. density-independent limiting factors |
| D. evolution | H. carrying capacity | |

1. ____ Regardless of population size, ____ curb population growth.
2. ____ Different species that have adapted similarly in similar niches are examples of ____ .
3. ____ When a population reaches its ____ , population size levels off.
4. ____ The extinction of a population that failed to compete successfully for a limited food source is called ____ .
5. ____ The role of an organism in its ecosystem is called its ____ .
6. ____ The increase in an organism's population when conditions and resources are not limiting follows a pattern of ____ .
7. ____ Two species that interact closely with each other change in ways that are to their mutual benefit through the process of ____ .
8. ____ A(n) ____ is an organism that maintains high biodiversity in its habitat by limiting the populations of its prey.
9. ____ The process of change in a population of organisms over time is called ____ .
10. ____ The larger a population becomes, the more its rate of growth is affected by ____ .



CHAPTER 6

SECTION REVIEW 6.1

Complete the following.

1. Give an example of a species that is the prey of another species. _____

2. Give an example of a predator. _____

3. Explain why predators and their prey have similar population cycles. _____



4. What is parasitism? _____



5. Explain why parasites are a density-dependent limiting factor. _____

6. What is symbiosis? _____

7. Give examples of organisms in the following symbiotic relationships:

a. parasitism _____

b. commensalism _____

c. mutualism _____

Name: _____ Class: _____ Date: _____

CHAPTER 6

SECTION REVIEW 6.2

Complete the following.

1. Describe the process of primary succession in a lifeless habitat, such as a cooled lava field.

2. Describe the process of secondary succession in a habitat left devastated by fire. _____



3. Describe the process of aquatic succession. _____

4. List two things that are unique about organisms that are part of island succession.

a. _____

b. _____

CHAPTER 6

SECTION REVIEW 6.3

Complete the following.

1. Identify several factors that contribute to change within an ecosystem. _____

2. Give an example of one ecosystem replacing another following a major disruption. _____

3. Why do scientists have difficulty predicting how ecosystems will be affected by changes in the environment? _____



4. What is one cause of the current high rate of species' extinction? _____

5. In your own words, describe the concept of equilibrium in an ecosystem. _____

CHAPTER 6

SECTION REVIEW 6.4

Complete the following.

1. How is a biome different from a habitat? _____

2. List the eight major terrestrial biomes on Earth. _____



3. Why is the destruction of rain forests such a serious problem? _____



Use the graph in Figure 6.12 on page 100 to answer the following questions.

4. Which biome has the greatest range of temperatures? _____

5. How does the tundra biome differ from the desert biome? _____

6. What biome would you expect to find in an area having 100 cm of precipitation a year and an average annual temperature of 15°C? _____

Use the map on page 100 to answer the following question.

7. What biomes are found in North America? _____

CHAPTER 6

VOCABULARY REVIEW

ECOSYSTEM BALANCE

Each clue describes a vocabulary term. Read the clues and write the letters of each vocabulary term in the blanks.

1. **Clue:** A major type of ecosystem, such as a tundra.

— — — — ()

2. **Clue:** Commensalism and mutualism are two types of this.

— — — () — — — — —

3. **Clue:** Organism that secretes acid that breaks down bare rock.

— — — — — ()



4. **Clue:** Process that eventually restores the climax community.

— — — — — — — — — —
— — — () — — — — — — — —



5. **Clue:** Relationship where an organism feeds on another's tissues or fluids.

— () — — — — — — — — —

6. **Clue:** Type of community that does not change much over time.

— () — — — — —
— — — — — — — — — —

7. **Clue:** Process in which the first step is soil formation.

— — — — — () — — — — —
— — — — — — — — — —

Write the letters found inside the circles on the blanks below. Unscramble them to find a word that relates to a stable ecosystem.

Scrambled letters:

— — — — — — — — — —

Solution:

— — — — — — — — — —

UNIT REVIEW 2

ECOLOGICAL INTERACTIONS

Complete the following.

1. a. On a separate sheet of paper, draw a diagram that illustrates the trophic levels in an ecosystem. Label each level and use arrows to indicate the direction of energy in the ecosystem.

- b. What is the importance of the sun to each of the levels represented in your diagram?

2. Give examples of some species in which you would expect biological magnification to be greatest. Why? _____



3. Consider the typical pattern of an ecological pyramid. On a separate sheet of paper, draw a biomass pyramid that contains the following elements: birds of prey, 1000 kg of grasses, small birds, insects. Give the amount of biomass in kg at each level.



4. What is the difference between coevolution and convergent evolution? _____

5. What might happen to the human population as it continues to grow exponentially?

6. Name an example of a place that is currently undergoing the process of primary succession.

7. What percentage of Earth's land surface is covered by desert, and what percentage of Earth's biomass exists there? _____

CHAPTER 7

SECTION REVIEW 7.1

Complete the following.

1. What characteristic is common to all deserts of the world? _____

2. What is the limiting factor in the desert biome? _____

3. Name four types of plants adapted to the desert environment.
a. _____
b. _____
c. _____
d. _____



4. Describe how one of the plants mentioned in question 3 is adapted to the desert biome.

5. Where are the two main types of deserts in the United States located, and how do they differ?

6. Briefly describe the climate of a desert biome. _____

7. Why are many desert animals nocturnal? _____

CHAPTER 7

SECTION REVIEW 7.2

Complete the following.

1. Where are the desert belts located? _____

2. Why is air over the equator very moist? _____

3. Describe how desert belts are formed. _____



4. Explain the rainshadow effect. _____

5. What is a semiarid region? _____

6. What is desertification? _____

7. Give an example of one human activity that might cause desertification. _____

CHAPTER 7

SECTION REVIEW 7.3

Complete the following.

1. What percentage of the Earth's surface is covered by tundra? _____

2. Why is the tundra ecosystem considered fragile and unstable? _____

3. What is the limiting factor in the tundra? _____

4. Describe the climate of the tundra. _____



5. What is permafrost and how does it affect other elements of the tundra ecosystem?

6. Describe some adaptations of plants in the tundra. _____

7. Describe some adaptations of animals in the tundra. _____

CHAPTER 7

VOCABULARY REVIEW

DESERT AND TUNDRA BIOMES

Match the correct vocabulary term to each of the numbered statements.

- | | | |
|-----------------------------|----------------------|----------------------|
| A. rainshadow effect | E. migrate | I. permafrost |
| B. spines | F. succulents | J. lichens |
| C. desertification | G. leaching | K. nocturnal |
| D. tropics | H. pavement | |

I. Deserts

1. ____ Because deserts do not receive much rainfall, there is little ____ of minerals from the soil.
2. ____ Beneath desert soil lies the ____, or desert floor, which is made of hard-baked sand or bare rock.
3. ____ Cacti and other ____ are adapted to desert conditions with specialized structures such as ____.
4. ____ ____ animals protect themselves from the desert's heat by sleeping in shelters during the day and going outside only at night.



II. Formation of Deserts

5. ____ The ____ are regions near the equator that have very moist air.
6. ____ The process by which a desert forms on one side of a mountain range is the ____.
7. ____ ____ is the result of human activities such as overgrazing.

III. Tundra

8. ____ Beneath the active zone is ____, which is crucial to the formation of bogs, ponds, and streams in the tundra.
9. ____ Many animals ____ to the tundra seasonally.
10. ____ ____ are the producers in the tundra.

CHAPTER 8

SECTION REVIEW 8.1

Complete the following.

1. What is a grassland? _____

2. What is the desert-grassland boundary, and why is it changeable? _____



3. What is the most common organism living in the grasslands and in what ways is it adapted to life in this biome? _____



4. Explain the important role of grass fires in grasslands. _____

5. What adaptation of some plants and trees enables them to survive long periods without rain? _____

6. List the three grassland biomes.
a. _____
b. _____
c. _____

CHAPTER 8

SECTION REVIEW 8.2

Complete the following.

1. What is a steppe? _____

2. What distinguishes a steppe from a desert? _____

3. Describe the climate of a steppe. _____



4. What are prairies? _____



5. Which has more fertile soil, a prairie or a steppe? Why? _____

6. Explain how bunchgrasses are adapted to the steppe. _____

7. Name some behavioral adaptations of animals to the steppe and prairie. _____

CHAPTER 8

SECTION REVIEW 8.3

Complete the following.

1. What is the definition of a savanna? _____

2. Describe the climate of the savanna. _____

3. What is a runner and how does it protect plants from their environment? _____



4. What advantages do savanna plants have by growing rapidly? _____



5. Name some typical organisms of the savanna. _____

6. What advantage do savanna trees and shrubs that grow thorns have? _____

7. What is a vertical feeding pattern? _____

8. Name some animals that exhibit a vertical feeding pattern. _____

CHAPTER 8

VOCABULARY REVIEW

GRASSLAND BIOMES

Use these terms to complete the following.

humus	tufts	desert-grassland boundary
grasslands	sod-forming grasses	savanna
vertical feeding pattern	runner	steppe
prairie	bunchgrasses	

1. Large clumps of tall, coarse grasses found in savannas.

2. Biome that receives more rain than a desert, but not enough to support a forest.

3. Organisms that form a mat of soil and roots that helps add organic matter to prairie soils.

4. Underground stem that ensures a plant's survival despite grass fires.

5. Behavior that enables different animal species to feed in the same area without competing.

6. Biome that is characterized by rolling hills, plains, and tall grasses.

7. Decayed organic matter.

8. Biome that is characterized by rainy seasons and long periods of drought.

9. Area that supports some grasses, but can become desert if the climate changes.

10. Grassland that receives less than 50 cm of annual rainfall.

11. Short, fine-blade grasses that grow in clumps.



CHAPTER 9

SECTION REVIEW 9.1

Complete the following.

1. Describe the climate of a coniferous forest. _____

2. What is a conifer? _____

3. Name three kinds of conifers.
 - a. _____
 - b. _____
 - c. _____
4. What are some features of conifers? _____

5. Why is snow important to the coniferous forest? _____

6. Why is the soil of a coniferous forest poor? _____

7. Name five organisms of the coniferous forest.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____



CHAPTER 9

SECTION REVIEW 9.2

Complete the following.

1. What is a deciduous tree? _____

2. In what part of the globe are deciduous forests located? _____

3. Describe the climate of a deciduous forest biome. _____



4. How are deciduous trees adapted to the temperate zone? _____



5. Why have humans cleared vast stretches of deciduous forests? _____

6. Why is the recovery of the forest biome slow even when trees are replanted? _____

CHAPTER 9

SECTION REVIEW 9.3

Complete the following.

1. What is a rain forest? _____

2. Where are rain forests located? _____

3. Describe the climate of a rain forest. _____



4. Why is the soil of a rain forest poor? _____



5. Where do the majority of organisms live in the rain forest? _____

6. Explain why the rain forest is said to be a *vertical* ecosystem. _____

7. How is the diversity of the rain forest being threatened? _____

CHAPTER 9

VOCABULARY REVIEW

FOREST BIOMES

Each clue describes a vocabulary term. Read the clues and write the letters of each vocabulary term on the blanks.

1. **Clue:** Tree that produces cones.

— — — — ○ — —

2. **Clue:** Biome that supports the most diversity of life on Earth.

○ — — — —
— — — — ○ — —

3. **Clue:** Term describing a tree that sheds its leaves seasonally.

— — — — — — ○ — ○

4. **Clue:** Process of forest destruction around the world because of humans.

— — — — — — — ○ — — ○ — — — —



Write the letters found inside the circles on the blanks below. Unscramble them to find the central idea of the chapter.

Scrambled letters:

— — — — — — — —

Solution:

— — — — — — — —

CHAPTER 10

SECTION REVIEW 10.1

Complete the following.

1. What is an aquatic biome? _____

2. What two major factors are used to characterize aquatic biomes?
 - a. _____
 - b. _____
3. What are the two main types of aquatic biomes?
 - a. _____
 - b. _____
4. How do the salinities of ocean water and fresh water compare? _____

5. What is brackish water and where is it usually located? _____

6. Name two examples of hypersaline lakes.
 - a. _____
 - b. _____
7. Describe the role of sunlight in aquatic biomes. _____

8. In which zone of an ocean would you expect to find more living organisms? Explain.



CHAPTER 10

SECTION REVIEW 10.2

Complete the following.

1. What are the two main types of freshwater biomes? Give examples of each type.
 - a. _____

 - b. _____

2. What organisms can be found drifting in a pond or lake and what is their role in the ecosystem?



3. What are wetlands? Name some examples of wetlands. _____



4. What are some of the beneficial effects wetlands have on the biosphere? _____

5. What have been some obstacles to protecting wetlands? _____

6. Explain the significance of alligators to the wetland community. _____

CHAPTER 10

SECTION REVIEW 10.3

Complete the following.

1. What are some organism adaptations to the movement of water in a stream? _____

2. Where do streams form? _____

3. What causes a stream to flow? _____

4. What is headwater and what are some of its characteristics? _____



5. Define sediments. _____



6. Explain how sedimentation and erosion cause the course of a stream to change over time.

7. In what ways have people changed stream habitats? _____

CHAPTER 10

VOCABULARY REVIEW

FRESHWATER BIOMES

Use a dictionary to write word derivations for each of the key terms below. Follow the same style as in the example below.

everglades, from the Middle English *glad*, “a bright, smooth place.”

1. sediment _____

2. zooplankton _____



3. benthic zone _____



4. photic zone _____

5. salinity _____

6. phytoplankton _____

CHAPTER 11

SECTION REVIEW 11.1

Complete the following.

1. What is the largest horizontal zone of the marine biome and what is its range? _____

2. How deep is the ocean's photic zone? _____

3. What makes the ocean's aphotic zone comparable to a desert biome? _____



4. What is detritus and what is its importance to aquatic food webs? _____



5. Describe how the characteristics of oceans around the world vary. _____

6. What are ocean currents? _____

7. What causes ocean currents? _____

CHAPTER 11

SECTION REVIEW 11.2

Complete the following.

1. What is the continental shelf? _____

2. What percentage of the ocean does the neritic zone account for? _____

3. What are the two types of neritic ecosystems?
 - a. _____
 - b. _____
4. Describe the importance of coral reefs to ocean organisms and to humans. _____

5. How can a coral reef be considered an indicator of water quality? _____

6. What is an estuary? _____

7. What factors contribute to neritic zone productivity? _____



CHAPTER 11

SECTION REVIEW 11.3

Complete the following.

1. What is the intertidal zone? _____

2. What are two types of ecosystems in the intertidal zone?
a. _____
b. _____

3. Describe two different ways in which salt marshes support animal life. _____

4. Explain the process by which a salt marsh forms. _____

5. How is the mangrove tree adapted to the conditions of a swamp? _____

6. What are some reasons for the destruction of mangrove swamps? _____



UNIT REVIEW 3

BIOMES

1. On a separate sheet of paper, design a plant that is adapted to life in a hot desert biome, and explain how the plant is suited to the conditions of this biome.
2. On a separate sheet of paper draw a diagram that shows the rainshadow effect of a mountain range.
3. Why is desertification an important concern? _____

4. Why would you not expect to find many reptiles living in the tundra? _____



5. What role have humans played in the destruction of prairies in the United States? _____



6. On a separate sheet of paper, draw and label the layers of a deciduous forest.

7. Describe the three depth zones of an ocean biome.

a. _____

b. _____

c. _____

8. Why might some people be interested in tracking the ocean's currents? _____

9. Which land biome may be compared to a neritic ecosystem in terms of biodiversity? Explain.

CHAPTER 12

SECTION REVIEW 12.1

Complete the following.

1. a. Identify and describe four systems of the Earth. _____

b. Explain how the four systems are connected. Give an example. _____

c. What energy source powers many of these systems? _____

2. Give examples of systems that are powered by the energy source you named in question 1.c.

3. How does the industrial view of nature compare to the view of Earth in the Gaia hypothesis?

4. What has been the impact of the Gaia hypothesis on the scientific community? _____



Name: _____ Class: _____ Date: _____

CHAPTER 12

SECTION REVIEW 12.2

Complete the following.

1. Which type of society impacts the environment least? Explain. _____

2. Describe two ways in which farming has changed the way that people live. _____



3. How have agricultural societies harmed the environment? _____



4. What is an industrial society? _____

5. How has the development of industrial societies led to an increase in human populations?

6. List several problems that have been caused by industrial societies. _____

CHAPTER 12

SECTION REVIEW 12.3

Complete the following.

1. What is the sustainable development ethic? _____

2. Explain specifically how the frontier ethic is in opposition to the sustainable development ethic. Why is the frontier ethic now seen as unrealistic? _____



3. How must people change in order to achieve sustainable development? _____



4. Why should a society based on the ethic of sustainable development be able to survive indefinitely? _____

5. List three renewable resources. _____

6. List three nonrenewable resources. _____

CHAPTER 12

VOCABULARY REVIEW

PEOPLE AND THEIR NEEDS

Match the correct vocabulary term to each of the numbered statements. Write the letter of the correct term next to the number.

- A.** agricultural society **D.** hunter-gatherer society **F.** renewable resource
B. sustainable development ethic **E.** frontier ethic **G.** industrial society
C. Gaia hypothesis

1. ____ Can regenerate itself.
2. ____ Includes the view that humans are part of nature.
3. ____ Way of life that has been based on the frontier ethic.
4. ____ Way of life that has the least impact on the environment.
5. ____ Includes the view that humans are separate from nature.
6. ____ Way of life in which people live in permanent settlements, grow crops, and have specialized roles.
7. ____ Views Earth as a single living organism.



CHAPTER 13

SECTION REVIEW 13.1

Complete the following.

1. What were Malthus's views about population growth vs. food supply growth? _____

2. What two rates affect overall population growth? Explain. _____

3. What event marks the second period of major population growth about 10,000 years ago?
How did this event influence population growth? _____



4. What era began about 300 years ago and also brought about major population growth?
Explain how. _____



5. a. What is the germ theory? _____

b. How has the germ theory helped to contribute to population growth? _____

6. What are some contributing factors to declines in growth rates? _____

CHAPTER 13

SECTION REVIEW 13.2

Complete the following.

1. a. Why is knowing the rate of population growth important? _____

b. Who might use this information? _____

2. How are population growth rates determined? _____



3. What is meant by the *doubling time* of a population? _____



4. Other than birth and death rates, what other factors can affect the doubling time of a population? _____

5. What is demography? _____

6. Why do you think industrialized nations generally use more resources than developing nations? _____

CHAPTER 13

SECTION REVIEW 13.3

Complete the following.

1. How can overpopulation affect the global ecosystem? _____

2. What are some obstacles to controlling population size? _____



3. What are some problems that nations with declining populations face? _____



4. How might technology remedy some of the problems of overpopulation? _____

5. Why do some scientists feel that technology cannot solve the problems of overpopulation? What evidence supports these views? _____

CHAPTER 13

VOCABULARY REVIEW

HUMAN POPULATION

Each clue describes a vocabulary term. Read the clues and write the letters of each vocabulary term on the blanks.

1. **Clue:** Period during which hunter-gatherers settled down and developed farming skills.

— — — — — () — — — — —
 — — () — — — — —

2. **Clue:** Disaster that can devastate a human population, as it did in Ireland.

— — — () — —

3. **Clue:** Survey used to determine population size.

— — () — — —

4. **Clue:** Scientific development that identified the agents responsible for diseases.

— () — — — () — — — — —

5. **Clue:** Number of years it takes for a population to increase by 100%.

— () — — — () — — — — —

6. **Clue:** Something that declines as a result of improved health and hygiene.

— — — () — — — () — — —

7. **Clue:** Disaster that reduced the population in Central Europe and Asia by about 25 percent.

— — — () — — — — — () — — — — —

8. **Clue:** The science of changing vital statistics in a human population.

— — — () — — — — — () — — —

Write the letters found inside the circles on the blanks below. Unscramble them to find the central idea of the chapter.

Scrambled letters: _____

Solution: _____



CHAPTER 14

SECTION REVIEW 14.1

Complete the following.

1. What are the two main groups of nutrients? _____

2. What is a kilocalorie? _____

3. a. What is a carbohydrate? _____

- b. Name three foods that are high in carbohydrates. _____

4. Why is protein important to the diet? _____

5. Why is too much fat not desirable in a healthful diet? _____

6. What is the importance of vitamins and minerals in a healthful diet? _____

7. How is it possible for a person with an adequate food supply to suffer from malnutrition?

8. Name three diseases caused by vitamin deficiency. _____

9. How are micronutrients sometimes lost from plant foods before people eat them? _____



Name: _____ Class: _____ Date: _____

CHAPTER 14

SECTION REVIEW 14.2

Complete the following.

1. What is the Green Revolution? _____

2. What has been the irony of the Green Revolution for the underfed nations of the world? Explain. _____



3. What is a cash crop? _____

4. How can the widespread growth of cash crops contribute to a nation's hunger? _____



5. What is aquaculture? _____

6. Why has the development of aquaculture become necessary? _____

CHAPTER 14

SECTION REVIEW 14.3

Complete the following.

1. Identify some ways that farming techniques have changed in the past 50 years. _____
- _____
- _____
- _____
- _____
- _____



2. What has been the plight of many small, family-run farms in recent years? Why? _____
- _____
- _____



3. What is agribusiness? _____
- _____
- _____
- _____

4. What are some of the problems associated with modern farming techniques? _____
- _____
- _____
- _____
- _____

5. Why are scientists looking to cultivate more traditional crops in some areas? _____
- _____
- _____

CHAPTER 14

SECTION REVIEW 14.4

Complete the following.

1. What is sustainable agriculture? _____

2. a. What is crop rotation? _____

b. What is the purpose of crop rotation? _____



3. Why is the erosion of topsoil disastrous to agriculture? _____



4. How may erosion be reduced? _____

5. What is IPM, and what does it involve? _____

CHAPTER 14

VOCABULARY REVIEW

FEEDING THE WORLD

Use a dictionary to write word derivations for each of the key terms below. Follow the same style as in the example below.

everglades, from the Middle English *glad*, “a bright, smooth place.”

1. carbohydrate _____

2. protein _____



3. lipid _____



4. malnutrition _____

5. aquaculture _____

Match the correct vocabulary term to each of the numbered statements.

A. sustainable agriculture

C. cash crops

B. essential amino acids

D. Green Revolution

6. ____ Grown strictly for the purpose of export sale.

7. ____ Proteins in the body are made from these.

8. ____ Began in the mid-1960s with the development of new strains of wheat and rice.

9. ____ Method of farming based on crop rotation and the use of organic fertilizers.

UNIT REVIEW 4

PEOPLE IN THE GLOBAL ECOSYSTEM

1. Explain how industrial society might represent the success of the human species. Explain why that success may one day lead to serious consequences for the human population.

2. What is the difference between a renewable and a nonrenewable resource? Give an example of each.



3. On a separate sheet of paper, outline the three major periods of human population growth. For each period, highlight the specific factors that contributed to increased population.



4. What kinds of events could cause a decline in the growth rate of the human population?

5. Discuss why it might be beneficial to attempt to control human population growth. Then give some reasons why it might not be such a good idea.

6. Name several species of organisms that are raised successfully in aquaculture.

7. Describe the ideal organic farm. Be sure to take into consideration the issues of soil and pest management.

CHAPTER 15

SECTION REVIEW 15.1

Complete the following.

1. Name five forms of energy. _____

2. How is electricity commonly generated? _____

3. What are organic fuels? _____

4. What is a hydrocarbon? _____



5. Name three kinds of hydrocarbons. _____



6. What is a fossil fuel? _____

7. From where is the energy in a fossil fuel derived? _____

8. What are three kinds of fossil fuels? _____

CHAPTER 15

SECTION REVIEW 15.2

Complete the following.

1. How did coal form? _____

2. List and briefly describe the three types of coal.
a. _____
b. _____
c. _____



3. What is peat? _____



4. Why is peat not the best source of fuel? _____

5. What are the stages of coal formation? _____

6. Which type of coal is best for fuel? Explain. _____

CHAPTER 15

SECTION REVIEW 15.3

Complete the following.

1. Name three types of fossil fuels and the states of matter in which they occur naturally.

2. Briefly describe the process by which petroleum formed. _____



3. How is petroleum extracted? _____



4. Why is petroleum such an important resource? _____

5. What mixture of gases makes up natural gas? _____

6. Where is natural gas often found? _____

7. Why are appliances that use natural gas considered to be more energy-efficient? _____

CHAPTER 15

SECTION REVIEW 15.4

Complete the following.

1. What are the main problems associated with the use of fossil fuels? _____

2. How does the burning of fossil fuels threaten the environment? _____



3. What is a biomass fuel? _____

4. Identify three sources of biomass fuels. _____

5. What is the advantage of using biomass fuels in place of fossil fuels? _____

6. Provide an example of bioconversion. _____

CHAPTER 15

VOCABULARY REVIEW

ENERGY FROM ORGANIC FUELS

Match the correct vocabulary term to each of the numbered statements.

- | | | |
|-------------------------|------------------------|---------------------------|
| A. peat | E. fossil fuels | I. anthracite coal |
| B. bioconversion | F. petroleum | J. bituminous coal |
| C. natural gas | G. hydrocarbons | K. fuel |
| D. organic fuels | H. lignite | L. biomass fuels |

1. ____ Electricity is commonly produced when the stored energy in ____ is converted to mechanical energy to run turbines.
2. ____ Ethane and octane are two examples of ____ .
3. ____ Fuels that contain carbon compounds that were once part of living organisms are termed ____.
4. ____ Fuels such as coal and petroleum are ____ since they are derived from the remains of organisms that lived millions of years ago.
5. ____ Although it is not a form of coal, ____ is the first stage in the formation of coal.
6. ____ Composed of 40 percent carbon, ____ is a soft coal that burns quickly.
7. ____ ____, a soft coal formed deep in Earth's crust, is the most abundant type of coal mined in the United States.
8. ____ Hard and shiny, black in color, ____ burns hottest of all the types of coal.
9. ____ A liquid fossil fuel, ____ is found in pores and cracks deep underground.
10. ____ Usually a mixture of methane, ethane, propane, hydrogen sulfide, carbon dioxide, nitrogen, and helium, ____ is probably the cleanest-burning fossil fuel.
11. ____ Wood, garbage, methane, and alcohol are examples of ____.
12. ____ Organic materials are changed into fuels in a process called ____.



Name: _____ Class: _____ Date: _____

CHAPTER 16

SECTION REVIEW 16.1

Complete the following.

1. What is the nucleus of an atom? _____

2. What determines the basic properties of an atom? _____

3. What is meant by the term atomic mass? _____



4. Atoms of the same element that have different atomic masses are called _____



5. What is a radioactive element? _____

6. Name an example of a radioactive element. _____

7. What change takes place in an atom that undergoes radioactive decay? _____

CHAPTER 16

SECTION REVIEW 16.2

Complete the following.

1. Define nuclear fission. _____

2. Which isotope of which element is used most commonly in fission reactions? _____

3. How is a fission chain-reaction similar to what happens when a row of dominoes falls?



4. What happens to some of the mass of an atom of U-235 when it is split? _____



5. Why is it so important to regulate the speed of the chain reaction in a nuclear reactor?

6. How does a nuclear reactor generate electricity? _____

7. What is a breeder reactor? _____

CHAPTER 16

SECTION REVIEW 16.3

Complete the following.

1. What are some health risks associated with exposure to radiation? _____

2. From where do radioactive wastes originate? _____



3. For how many years will plutonium waste continue to be dangerously radioactive? _____



4. What difficulties are involved in the proper disposal of medium-level and high-level wastes? _____

5. What have been some problems associated with the disposal of low-level wastes? _____

6. What lesson do you think people learned from the accident at the nuclear power plant at Chernobyl? _____

CHAPTER 16

VOCABULARY REVIEW

NUCLEAR ENERGY

Match the correct vocabulary term to each of the numbered statements. Write the letter of the correct term next to the number.

- | | |
|----------------------------|--|
| A. isotopes | E. half-life |
| B. high-level waste | F. meltdown |
| C. nucleus | G. radiation |
| D. nuclear fission | H. low- and medium-level wastes |

1. ____ The result of a nuclear chain reaction going out of control in a reactor.
2. ____ Term used to describe what happens when alpha particles, beta particles, and gamma rays are given off in the decaying of unstable nuclei.
3. ____ Pu-239 is an example of this.
4. ____ The amount of time in which half the atoms in a sample of radioactive material decay.
5. ____ U-235 and U-238 are examples of these.
6. ____ Wastes that are not as radioactive as Pu-239.
7. ____ The cluster of protons and neutrons at an atom's center.
8. ____ A reaction in which the nucleus of a large atom is split into smaller nuclei.



CHAPTER 17

SECTION REVIEW 17.1

Complete the following.

1. People burn fossil fuels and use both wind and water to generate electrical power. Explain how the energy in all of these sources originates from the sun's energy. _____

2. What generates the sun's energy? _____

3. What are some advantages and disadvantages of using solar energy? _____



4. What is passive solar heating? Explain how a house should be built to maximize solar heating.



5. What is active solar heating? Provide some examples of the equipment involved. _____

6. What is a photovoltaic cell? _____

7. What are some advantages of photovoltaic cells? _____

CHAPTER 17

SECTION REVIEW 17.2

Complete the following.

1. How is the energy from moving water used? _____

2. What are the advantages of using hydroelectric power? _____



3. What is the function of a dam? _____



4. a. What have been some advantages of the use of dams? _____

b. What have been some disadvantages of the use of dams? _____

5. What are some concerns about using tidal generators? _____

CHAPTER 17

SECTION REVIEW 17.3

Complete the following.

1. How do the two types of aerogenerators function? _____

2. What is a wind farm? _____



3. Where are wind farms usually located? _____



4. What are some environmental concerns regarding aerogenerators? _____

5. Do you think that wind energy is a practical alternative energy source? Provide reasons to support your answer. _____

CHAPTER 17

SECTION REVIEW 17.4

Complete the following.

1. What is geothermal energy? _____

2. How is geothermal energy generated? _____

3. How is geothermal energy currently used by people? _____



4. What are some problems associated with using geothermal energy? _____



5. What is nuclear fusion? _____

6. What are the theoretical advantages of nuclear fusion over other energy sources? _____

CHAPTER 17

VOCABULARY REVIEW

ALTERNATIVE ENERGY SOURCES

Use a dictionary to write word derivations for each of the key terms below. Follow the same style as in the example below.

everglades, from the Middle English *glad*, “a bright, smooth place.”

1. solar energy _____

2. photovoltaic cell _____



3. hydroelectric power _____



4. aerogenerator _____

5. geothermal energy _____

6. nuclear fusion _____

UNIT REVIEW 5

ENERGY RESOURCES

1. What are some reasons why people might want to decrease their dependence on fossil fuels?

2. Suggest some ways to reduce dependence on fossil fuels. _____



3. What is bioconversion? _____



4. What are some advantages and disadvantages of nuclear energy? _____

5. On a separate sheet of paper, sketch out the steps in the fission of a U-235 atom.

6. Why may low-level wastes pose a more serious health threat to people than high-level wastes?

7. Identify five energy sources that are alternatives to fossil fuels. _____

8. What is the difference between nuclear fission and nuclear fusion? What is similar about them?

CHAPTER 18

SECTION REVIEW 18.1

Complete the following.

1. Give an example of a mineral composed of only one element. _____

2. Give an example of a mineral that is a compound of elements. _____

3. What are ores? Give an example of an ore. _____



4. What properties make metals useful? _____



5. Name three nonmetallic minerals and their uses. _____

6. How can political instability in a nation that exports metals affect nations that import metals? _____

CHAPTER 18

SECTION REVIEW 18.2

Complete the following.

1. What methods are used to locate minerals? _____

2. What kinds of environmental damage are caused by the extraction of minerals? _____



3. What are some alternatives to mineral extraction that would help to minimize damage to the environment and conserve mineral resources? _____

4. Give examples of mineral resources that can be conserved by using each of the alternatives mentioned in question 3. _____

CHAPTER 18

SECTION REVIEW 18.3

Complete the following.

1. What is weathering? _____

2. What are the two types of weathering? _____

3. What is soil? _____



4. Briefly describe the process of soil formation. _____



5. What are the three major soil types and some of their characteristics? _____

6. What is the most important factor in the formation of soil and why? _____

CHAPTER 18

SECTION REVIEW 18.4

Complete the following.

1. What are some human activities that bring about removal of large areas of vegetation?

2. Explain the connection between soil organisms and soil fertility. _____



3. What are some things that enter the soil and harm the organisms that live in it? _____



4. What causes soil compaction? _____

5. What are some eventual outcomes of soil mismanagement? _____

CHAPTER 18

VOCABULARY REVIEW

MINERALS AND SOILS

Each clue describes a vocabulary term. Read the clues and write the letters of each vocabulary term on the blanks.

1. **Clue:** A mixture of mineral particles, air, water, organic matter, and living organisms.

○ _____

2. **Clue:** Source of an area of soil in the bedrock.

_____ ○ _____ ○ _____

3. **Clue:** Rock or mineral containing economically desirable metal or nonmetal.

_____ ○ _____

4. **Clue:** A vertical cross section of soil.

○ _____ ○ _____

5. **Clue:** Solid layers of igneous, metamorphic, and sedimentary rock.

_____ ○ _____

6. **Clue:** May be either a single element or a compound of elements.

_____ ○ _____

7. **Clue:** The use of the same product over and over again.

_____ ○ _____

Write the letters found inside the circles on the blanks below. Unscramble them to find the central idea of the chapter.

Scrambled letters:

Clue: Minerals and soil are examples of these.



CHAPTER 19

SECTION REVIEW 19.1

Complete the following.

1. What are some health risks associated with the improper disposal of solid wastes? _____

2. What percentage of today's garbage goes into landfills? _____

3. What problems are associated with using oceans for garbage disposal? _____



4. What is a landfill? _____



5. What problems are associated with landfills? _____

6. What are some benefits derived from sanitary landfills? _____

CHAPTER 19

SECTION REVIEW 19.2

Complete the following.

1. What dangers do hazardous wastes pose to humans? _____



2. What is the purpose of classifying hazardous wastes? _____



3. Name four categories of hazardous wastes and provide one example of a hazardous waste for each of the categories.
- a. _____

- b. _____

- c. _____

- d. _____

CHAPTER 19

SECTION REVIEW 19.3

Complete the following.

1. What is the difference between weathering and erosion? _____

2. What are the major causes of erosion? _____

3. Which human activities lead to soil erosion? _____

4. How much topsoil is lost each year in the United States due to wind and water erosion?

5. What is involved in strip-cropping? _____

6. How does contour farming help to prevent soil erosion? _____

7. On what kind of land is terracing used? _____

8. What are shelter belts? _____



CHAPTER 19

SECTION REVIEW 19.4

Complete the following.

1. What percentage of landfill wastes are disposable items, such as napkins and diapers?

2. Identify three ways to reduce wastes.

3. a. What is meant by a biodegradable material?

- b. Name some examples of biodegradable materials.

4. What is Superfund and what is its purpose?

5. What are some methods of hazardous waste disposal?

6. Why do wastes from the United States and many European countries usually end up in developing countries?

7. What is needed to ease the problem of hazardous waste disposal?



CHAPTER 19

VOCABULARY REVIEW

LAND POLLUTION

Match the correct vocabulary term to each of the numbered statements. Write the letter of the correct term next to the number.

- A. hazardous wastes
- B. compost pile
- C. solid wastes
- D. controlled incineration
- E. landfill
- F. biodegradable

1. ____ Term describing substances that decompose easily.
2. ____ Lye, battery acid, mercury, and used syringes are examples of these.
3. ____ Burning of wastes at temperatures high enough to destroy hazardous materials.
4. ____ All garbage, refuse, and sludge products.
5. ____ Collection of plant wastes that are allowed to decompose naturally and enrich soil.
6. ____ Place where garbage is buried.



Name: _____ Class: _____ Date: _____

CHAPTER 20

SECTION REVIEW 20.1

Complete the following.

1. Why should fresh water be used sparingly? _____

2. How much water is used daily by the average person in the United States? _____

3. What are some industrial uses of water? _____



4. For what purpose is most of the fresh water in the United States used? _____



5. What are the advantages and disadvantages of two common methods of irrigation? _____

6. What are some effects of water use on ecosystems? _____

CHAPTER 20

SECTION REVIEW 20.2

Complete the following.

1. What is surface water? _____

2. What are some sources of surface water? _____

3. What is runoff? _____

4. How does groundwater accumulate? _____

5. What is another name for an aquifer? _____

6. What determines the rate at which water in an aquifer moves? _____

7. What is overdraft? _____

8. What problems result from overdraft? _____



CHAPTER 20

SECTION REVIEW 20.3

Complete the following.

1. How are penguins able to get the water they need from salt water, while most other organisms cannot? _____

2. What is desalination? _____

3. What are the three most common methods of desalination? Briefly describe each one.

a. _____

b. _____

c. _____

4. What is the main disadvantage of desalination methods? _____

5. What methods are used to purify water? _____

6. What are some agents used to purify water? _____

7. Why is water purification necessary? _____



CHAPTER 21

SECTION REVIEW 21.1

Complete the following.

1. What problems are caused by ocean dumping? _____

2. What are some sources of sewage? _____

3. What is the purpose of a sewage-treatment plant? _____



4. What are pathogens? _____



5. Name some pathogens found in water. _____

6. What are some common water pollutants? _____

7. What are the sources of water pollution? _____

CHAPTER 21

SECTION REVIEW 21.2

Complete the following.

1. What are toxic chemicals? _____

2. What is the difference between organic and inorganic chemicals? _____

3. a. What are heavy metals? _____

- b. What are some examples of heavy metals? _____

4. How do heavy metals enter water systems? _____

5. What are some health risks associated with heavy metals? _____

6. Identify some examples of organic pollutants. _____

7. Why are oil spills hazardous to water ecosystems? _____

8. What are the dangers of eutrophication? _____



CHAPTER 21

SECTION REVIEW 21.3

Complete the following.

1. Where do radioactive pollutants originate? _____

2. Why are radioactive pollutants such a threat to living organisms? _____

3. Where does thermal pollution originate? _____



4. What is the process by which thermal pollution occurs? _____



5. In what ways does thermal pollution affect water ecosystems? _____

CHAPTER 21

SECTION REVIEW 21.4

Complete the following.

1. Why have laws to control water pollution not been entirely successful? _____

2. What has been the role of industry in the failure of water pollution laws? _____



3. What incident sparked the passage of the Clean Water Act? _____



4. What is the goal of the Clean Water Act? _____

5. How might water-quality goals be met? _____

CHAPTER 21

VOCABULARY REVIEW

WATER POLLUTION

Use a dictionary to write word derivations for each of the key terms below. Follow the same style as in the example below.

everglades, from the Middle English *glad*, “a bright, smooth place.”

1. pathogen _____

2. toxic chemical _____

3. thermal pollution _____

4. eutrophication _____



Match the correct vocabulary term to each of the numbered statements.

A. heavy metal

B. sewage

C. sewage-treatment plant

5. ____ Water carrying organic wastes from humans and industry.

6. ____ Mercury is one example of this.

7. ____ A facility that processes organic wastes from humans and industry.

CHAPTER 22

SECTION REVIEW 22.1

Complete the following.

1. What are some natural sources of air pollution? _____

2. When did air pollution first become a widespread health and environmental problem?

3. What are particulates? _____



4. Identify five particulates. _____



5. Why are particulates dangerous to people? _____

6. Identify three gaseous pollutants. _____

7. What are some factors that help contribute to high levels of indoor air pollutants?

8. Identify five common sources of indoor air pollution. _____

CHAPTER 22

SECTION REVIEW 22.2

Complete the following.

1. What are the effects of air pollution on human health? _____

2. a. Which air pollutants are most hazardous to plants? _____

b. What characteristics could help you recognize plant damage from these air pollutants?



3. How do air pollutants affect animals? _____



4. Explain why carbon monoxide is a dangerous air pollutant. _____

CHAPTER 22

SECTION REVIEW 22.3

Complete the following.

1. What causes normal precipitation to become acidic? _____

2. What are some acids that fall to Earth with precipitation? _____

3. What is the function of ozone in the stratosphere? _____

4. What are some effects of UV radiation on living things? _____

5. Why is there concern about CFCs in the stratosphere? _____

6. In what ways do people use CFCs? _____

7. Define the term greenhouse effect. _____

8. What are some greenhouse gases and where do they originate? _____

9. What is global warming and what is believed to be its cause? _____



CHAPTER 22

SECTION REVIEW 22.4

Complete the following.

1. Name two natural air pollution controls and describe how they can remove pollutants from the air. _____

2. What are some limitations of natural controls to air pollution? _____



3. What is the best way to eliminate carbon dioxide emissions from automobiles? _____



4. What are some human efforts to control air pollution? _____

5. What are some drawbacks to the efforts mentioned in question 4? _____

CHAPTER 22

SECTION REVIEW 22.5

Complete the following.

1. Why is noise considered to be a form of pollution? _____

2. What are some health problems associated with noise pollution? _____

3. What are the units of sound intensity? _____



4. What sound ratings can lead to health problems? _____



5. Name some examples of things with extremely high sound ratings. _____

6. What are some ways to control noise pollution? _____

CHAPTER 22

VOCABULARY REVIEW

AIR AND NOISE POLLUTION

Match the correct vocabulary term to each of the numbered statements.

- | | | |
|--------------------------|------------------------------|-----------------------------|
| A. global warming | E. pollutants | I. greenhouse effect |
| B. emphysema | F. acid precipitation | J. particulates |
| C. CFCs | G. photochemical smog | K. cancer |
| D. ice cores | H. oxides | L. radon |

1. ____ Harmful materials that enter the environment.
2. ____ A colorless, radioactive gas that is a source of indoor pollution.
3. ____ A disease in which cells grow abnormally.
4. ____ Compounds of oxygen and another element.
5. ____ Pollutant once used as a coolant in air conditioners and refrigerators.
6. ____ A yellow-brown haze that forms when car pollutants react with sunlight.
7. ____ A disease in which air sacs in the lungs break down.
8. ____ Tiny solids or droplets suspended in the atmosphere.
9. ____ Rain or snow with a pH of 5.6 or lower.
10. ____ An increase in Earth's surface temperature.
11. ____ Used to study climate of the past.
12. ____ The trapping of radiated heat by gases in the atmosphere.



UNIT REVIEW 6

LAND AND WATER RESOURCES

1. Why is soil considered a nonrenewable resource? _____

2. What are some things people can do to help conserve soil? _____

3. What are some sources of land pollution? _____



4. What are some land management techniques that can help prevent soil erosion? _____



5. Are strict environmental laws enough to solve the problem of hazardous waste disposal? Explain. _____

6. Why should lawn sprinklers be used at night rather than during the day? _____

7. In your own words, define the following:
a. pathogens _____
b. thermal pollution _____

8. Why are people who eat meat and fish more likely to ingest heavy metals than are strict vegetarians? _____

9. Explain how it is possible for unspoiled lakes and forests far from urban areas to become affected by acid precipitation. _____

CHAPTER 23

SECTION REVIEW 23.1

Complete the following.

1. What is biodiversity? _____

2. Why do extinctions occur? _____

3. What are mass extinctions? _____



4. What percentage of all of the species that ever existed are now extinct? _____



5. What is causing the mass extinction of organisms today? _____

6. What is habitat destruction? _____

7. List some human activities that cause habitat destruction. _____

8. What is an alien species? Give an example. _____

CHAPTER 23

SECTION REVIEW 23.2

Complete the following.

1. What is the main cause of today's high rate of biodiversity loss? _____

2. What are the main causes of deforestation? _____

3. Why is the destruction of rain forests such a severe threat to biodiversity? _____



4. Give two reasons why people are cutting down rain forests. _____



5. How does clearing rain forests for farming affect the rainforest soil? _____

6. Give one reason why developed nations rely so heavily upon rain forests for wood. _____

7. Can a rain forest regenerate? Explain. _____

8. What are some specific causes for the loss of biodiversity in aquatic habitats? _____

CHAPTER 23

SECTION REVIEW 23.3

Complete the following.

1. What are the direct benefits of biodiversity to humans? _____

2. What are some uses of wild crop ancestors to plant geneticists? _____



3. What would be the impact of rainforest destruction to the field of medicine? _____



4. What is currently being done to save the genetic material of wild crop ancestors? _____

5. What is a wilderness? _____

6. What is the importance of wilderness areas? _____

7. How are today's mass extinctions different from natural patterns of extinction? _____

CHAPTER 23

SECTION REVIEW 23.4

Complete the following.

1. Describe the social and economic factors that cause the destruction of rain forests. _____

2. What international effort is underway to preserve species even if their habitats are destroyed?



3. Describe the purpose and function of the Endangered Species Act of 1973. _____



4. What are the flaws of the Endangered Species Act? _____

CHAPTER 24

SECTION REVIEW 24.1

Complete the following.

1. What is involved in the strategy of conservation? _____

2. Give an example of how demand for a resource could be reduced. _____

3. How does source reduction benefit the environment? _____



4. Give an example of how waste can be reduced. _____



5. What are the advantages of using fluorescent bulbs for lighting? _____

6. What is the purpose of an energy-rating number? _____

7. What are the advantages of carpooling? _____

CHAPTER 24

SECTION REVIEW 24.2

Complete the following.

1. Why is recycling cost-effective for manufacturers? _____

2. How does recycling benefit the environment? _____

3. What is the easiest material to recycle and in what products is this recycled material used?



4. How much less pollution is produced by recycling aluminum than by producing it from ore?



5. How does recycling motor oil protect the environment? _____

6. Why is recycling plastic more difficult than recycling other materials? _____

7. Why is recycling plastic especially important? _____

8. What are some products made from recovered plastics? _____

CHAPTER 24

SECTION REVIEW 24.3

Complete the following.

1. What has been the focus of conservation efforts in the United States until recently?

2. How was the California condor saved from extinction? _____

3. What are some of the problems with captive breeding programs? _____



4. What do ecologists think should be the focus of conservation efforts today? _____

5. What is a preserve? _____

6. What is the main problem conservation ecologists face in attempting to expand the size of existing preserves? _____

CHAPTER 24

VOCABULARY REVIEW

TOWARD A SUSTAINABLE FUTURE

Match the correct vocabulary term to each of the numbered statements.

- A.** source reduction **C.** recycling **E.** plastic
B. conservation **D.** fluorescent bulbs **F.** preserves

1. ____ ____ is a strategy to reduce the use of resources and ensure that they are used efficiently.
2. ____ Of all materials, it is especially important that ____ be reused because it does not break down naturally.
3. ____ By lowering the demand for a resource, ____ decreases the amount of a resource taken from the environment.
4. ____ The use of ____ is just one of many ways to limit the use of electricity.
5. ____ ____ is one of the most effective ways of conserving resources..
6. ____ One method of conserving biodiversity is through the development of ____ , but in most cases they are too small.



CHAPTER 25

SECTION REVIEW 25.1

Complete the following.

1. What are the two main concepts in economics? Define them.
 - a. _____
 - b. _____

2. Describe the relationships among supply, demand, and price. _____

3. What are some things that influence what people value and therefore what they demand?

4. How is the supply and demand for basic resources such as clean air, water, food, and space changing in the world today? _____

5. What is a policy? _____

6. What is risk assessment? _____

7. What are some problems associated with risk assessment? _____

8. What is a cost/benefit analysis? _____

9. What is the goal of a cost/benefit analysis? _____



CHAPTER 25

SECTION REVIEW 25.2

Complete the following.

1. List some examples of environmental issues that might best be addressed at the state or local level. _____

2. Why has there been a shift of environmental responsibility from the federal level to the state and local level since 1972? _____

3. What is required of citizens in order for them to help solve environmental problems at the state and local level? _____

4. How do the "bottle laws" encourage recycling? _____

5. What is an environmental impact study? _____



CHAPTER 25

SECTION REVIEW 25.3

Complete the following.

1. What must the federal government consider when setting policies about the national quality of life? _____

2. When does the federal government intervene on behalf of people regarding environmental quality? _____



3. Why does the problem of pollutants in the Mississippi River require environmental legislation on the federal level in order to be resolved? _____



4. Think of other possible situations in which activities in one state might affect the environment in another state. _____

5. What is the dispute regarding fishing rights in the Pacific Northwest and the Great Lakes regions? _____

CHAPTER 25

SECTION REVIEW 25.4

Complete the following.

1. Outline the conflict between developed and developing nations over environmental issues.

2. What were some issues discussed at the Earth Summit? _____



3. In your own words, identify and describe two resolutions made at the Earth Summit.



4. Describe how one concerned citizen was able to influence the large corporations involved in the tuna industry. _____

5. Think of another environmental problem and describe how a similar campaign could be initiated in order to help solve it. _____

6. What is the role of advocacy groups in setting environmental policies? _____

CHAPTER 25

VOCABULARY REVIEW

PROTECTING THE ENVIRONMENT

Match the correct vocabulary term to each of the numbered statements. Write the letter of the correct term next to the number.

- A.** supply **C.** supply-demand curve **E.** demand
B. cost/benefit analysis **D.** risk assessment **F.** policy

1. ____ A way to graphically depict the relationship between resources and the availability and cost for these resources.
2. ____ An outline of actions, incentives, penalties, and rules to follow concerning a particular issue.
3. ____ The determination of what is an acceptable amount of risk.
4. ____ The availability of a resource to be purchased.
5. ____ A way to identify impacts of environmental activities and determine the costs of these impacts.
6. ____ The amount of a resource that people desire and are willing to purchase.



UNIT REVIEW 7

MANAGING HUMAN IMPACT

1. Name some organisms that are threatened with extinction due to the activities of humans.

2. Which human activities are responsible for the actual and threatened extinction of many species? _____

3. How do today's mass extinctions threaten biodiversity? _____



4. What three basic concepts must people accept if they are to build a sustainable society?



5. How does the current thinking of conservationists differ from their earlier thinking?

6. Describe four behavioral changes people can adopt to help conserve resources or reduce waste.

7. What are some specific ways that individuals can influence policy-making decisions concerning environmental decisions? _____

8. Describe one of the problems associated with setting international environmental policies.

ANSWER KEY

CHAPTER 1

SECTION REVIEW 1.1

1. The solar system refers to the sun and the planets and asteroids that orbit it.
2. There are nine planets.
3. Earth is the third planet from the sun.
4. The inner planets are made mostly of rock while the outer planets are made mostly of gases.
5. Only Earth is known to support life.
6. a. Earth has liquid water, which is needed by most living things.
b. Earth has air containing oxygen, also needed by living things.
7. The sun's energy travels in waves.
8. Waves seen by the human eye are called the visible spectrum.
9. Organisms use the sun's energy in order to live.
10. a. The lithosphere is the layer of land on Earth's surface.
b. The hydrosphere is all Earth's water, whether it is located in oceans, lakes, clouds, or underground.
c. The atmosphere is the layer of air surrounding Earth.
11. Ecology is the study of interactions of nonliving and living parts of Earth.

SECTION REVIEW 1.2

1. a. Igneous—granite and basalt
b. Sedimentary—limestone and sandstone
c. Metamorphic—marble and slate
2. Rocks are classified by how they formed.
3. a. When lava cools, it solidifies and becomes igneous rock.
b. Rock fragments settle into layers and form sedimentary rock.
c. Rocks are changed to metamorphic rocks by heat and pressure.
4. 70% of Earth is covered by water.
5. 97% of Earth's water is salt water.
6. 3% of Earth's water is fresh.
7. Earth's salt water is located in the oceans and some lakes.
8. Earth's fresh water is located in lakes, ponds, streams, and underground.
9. It is frozen in polar ice caps and in glaciers.
10. a. Lakes, streams and rain runoff are examples of surface water.
b. The water in an aquifer is an example of groundwater.

SECTION REVIEW 1.3

1. The layers of gases that surround Earth are called the atmosphere.
2. a. Troposphere - from Earth's surface to about 8 to 18 km above it
b. Stratosphere - beyond the troposphere to about 50 km above Earth's surface
c. Mesosphere - beyond the stratosphere to about 85 km above Earth's surface
d. Thermosphere - beyond the mesosphere

3. Nitrogen (78%), oxygen (21%), carbon dioxide (0.04%), and other gases (less than 1%) make up Earth's air.
4. It is used by plants for making food.
5. The troposphere is closest to Earth's surface.
6. a. air
b. water vapor
c. most weather
7. Ozone is a form of oxygen gas containing three oxygen atoms per molecule.
8. Ozone is important to organisms because it filters out the sun's harmful UV radiation.
9. Rays from the sun bombard gas molecules in the thermosphere making them lose electrons. When gas molecules reunite with free electrons, light is given off.

SECTION REVIEW 1.4

1. All the parts of Earth that support life.
2. From the ocean bottom to the tops of the highest mountains, the biosphere is about 20 km thick.
3. a. Most life on Earth exists between 500 m below the ocean's surface to about 6 km above sea level.
b. The pressure below this level is too great for most organisms. Above this level, the air pressure is too low and the temperatures are too cold for most organisms.
4. a. air
b. water
c. food
5. Some examples include a change in the composition of seawater and the eruption of a volcano.
6. Some examples include beavers damming up a river and factories releasing harmful smoke into the atmosphere.

VOCABULARY REVIEW

1. I 2. J 3. M 4. L 5. F 6. E 7. K 8. H
9. A 10. N 11. B 12. D 13. G 14. C

CHAPTER 2

SECTION REVIEW 2.1

1. Science is a process by which information is learned about the world.
2. Because scientists cannot directly observe everything in nature, and because they cannot be sure that they have all the information that exists, scientific studies involve much uncertainty.
3. A hypothesis is a possible explanation for a set of observations.
4. New information causes scientists to change existing hypotheses and ways of looking at problems.
5. The invention of the TEM enabled scientists to view structures not previously seen within a cell. It revealed new information about some cellular structures.
6. Some challenges include feeding more and more people, curing and preventing the spread of AIDS, and developing new energy sources.
7. We are all consumers of the products of science, and as members of society, it is important to make informed decisions about these products.



SECTION REVIEW 2.2

1. A scientist must be prepared to backtrack or change direction during an investigation. There may also be surprising results or unexpected information during the investigation.
2. observation
3. Observations are made directly through the senses and with the help of tools.
4. Scales, microscopes, and Geiger counters are tools used by scientists. Accept all valid answers.
5. A scientist might repeat others' work to see if the experimental results are repeatable.
6. The scientist thinks of possible explanations for something observed and then chooses the one that he or she thinks is the most likely explanation.
7. A prediction is a statement about what the results of the experiment will be if the hypothesis is true.
8. A hypothesis is considered valid only after the experiment has been repeated many times and each result supports the hypothesis.
9. A variable is any factor that affects the outcome of an experiment.
10. Tables, circle graphs, bar graphs, and line graphs are used to represent data.

SECTION REVIEW 2.3

1. Environmental science is the study of environments in which organisms live.
2. Knowing what keeps the environment healthy will help to ensure that the biosphere will continue to support life in the future.
3. Biology, physics, and chemistry are all used in the study of environmental science. Accept all valid answers.
4. Some examples include humans, microbes, plants, birds, mushrooms, insects, and other living things.
5. Examples include water, soil, air, temperature, wind, sunlight, and other nonliving things.
6.
 - a. The deer population soared, the deer ate most of the plant life in the area, and then large numbers of deer starved to death.
 - b. Organisms can be affected by changes in the environment and can, in turn, make changes to the environment.
7. Some answers include: job losses; scarcities of food and fuel; and decreases in populations of certain organisms. Accept all reasonable responses.

VOCABULARY REVIEW

1. hypothesis
2. variable
3. biotic factor
4. environment
5. abiotic factor
6. control
7. prediction

Scrambled letters: [hessieicnmticftdo]

Solution: [scientific methods]

CHAPTER 3

SECTION REVIEW 3.1

1. Earth is about 4.5 billion years old.
2. Tectonic plates are large movable plates that make up the lithosphere.

3. Earthquakes can occur along the edges of tectonic plates when the plates shift.
4. The movement of tectonic plates and erosion can cause changes in the lithosphere.
5. Ice ages and El Niño are cyclical changes in the hydrosphere.
6. Ice scrapes against the land resulting in large-scale erosion in some places and deposits of rock materials in other places.
7. El Niño is a current of warm water that flows southward along the west coast of South America for a period of several months.
8. Some ways include: plants absorb carbon dioxide and release oxygen; people burn organic matter, which releases carbon, and can lead to the greenhouse effect; people use chemicals that deplete ozone.
9. Volcanic eruptions spew into the atmosphere water vapor, carbon dioxide, and sulfur gases, which winds can transport all around the world. Eruptions have been known to affect temperatures globally.

SECTION REVIEW 3.2

1. All organisms need water, a source of energy, living space, and a suitable climate.
2. rainfall
3. Temperature, nutrients, dissolved oxygen, and pollution all affect water quality.
4. photosynthesis
5. Organisms need minerals, vitamins, and other chemicals, which together are called nutrients.
6. Poisons build up in the cells of body tissues. When an organism eats an affected organism, it too may be poisoned.
7. Plants require a certain amount of space to obtain light and grow roots; animals need space in which to seek food, water, mates, and shelter.
8. Territorial animals, such as house cats, are animals that maintain specific areas in which they live.
9. Because birds and mammals are warm-blooded, they are able to maintain a constant body temperature regardless of the temperature of the environment.
10. During hibernation, an animal's heart and respiration rates slow, body temperature drops, and the animal enters a sleeplike state.

SECTION REVIEW 3.3

1. Their needs for certain resources are the same.
2. A habitat is the type of environment in which a particular species lives. It provides food, shelter, and temperature appropriate to the members of a particular species.
3. Tops of trees, streams, and rotting logs are all types of habitats. Other valid responses should reflect the idea that species are particular to environments that contain appropriate requirements.
4. Each species lives in a habitat that meets its requirements for food, space, and shelter. If a particular habitat is destroyed in one area, a species usually cannot survive in that area. As a result, the range of the species is reduced.
5. A community is bigger, since it includes all the populations that live in the same environment.



6. biodiversity
7. Destruction of habitat may lead to the extinction of some species in that habitat, thus reducing biodiversity.

VOCABULARY REVIEW

1. D 2. G 3. L, B 4. N 5. O 6. L 7. I, H 8. E
9. C 10. J 11. P 12. F 13. M 14. A

UNIT REVIEW 1

STUDYING EARTH

1.
 - a. The lithosphere, hydrosphere and the atmosphere should be represented in the illustration.
 - b. Answer should reflect how the biosphere occurs at an intersection of the three layers.
2. Since environmental science makes use of chemistry, biology, physics, and other natural sciences, it is called an integrated science.
3. An organism might make changes to its environment to meet its need for water, food and energy, space, and suitable climate.
4. Schematics should show that species make up a population, populations make up a community, and communities make up an ecosystem, which also includes abiotic factors.
5.
 - a. Some examples include medicines, vaccines, and technology used to treat diseases, but many other answers are possible.
 - b. Some examples include things that cause pollution, such as cars and factories, but many other answers are possible.
6. Scientists and consumers should act responsibly and use new information and products in ways that will benefit society.
7.
 - a. Igneous rock is rock formed when lava cools.
 - b. An aquifer is an underground river of groundwater.
 - c. The troposphere is the layer of the atmosphere closest to Earth's surface.
 - d. Metamorphic rock is rock that is formed by heat and great pressure.
8. Answer should reflect a combination of formation processes for all these rock types.



CHAPTER 4

SECTION REVIEW 4.1

1. Producers have the ability to make their own food; consumers lack this ability.
2. Students may name any land plant that carries out photosynthesis.
3. Students may name photosynthetic protists and bacteria, diatoms, and algae.
4. Consumers get energy by eating other organisms.
5.
 - a. Examples include grazing animals such as cows, buffalo, elk, antelope, and many insects.
 - b. Examples include lions, snakes, hawks, spiders, and so on.
 - c. Examples include bacteria, fungi, and earthworms.
6. Carnivores hunt their prey; scavengers eat animals that are already dead.

7. Decomposers break down the organic matter in organisms and return it to the soil, where it is once more available for plants to use.
8. A trophic level is a layer in the structure of feeding relationships in an ecosystem.
9. The first trophic level—producers—is the largest.
10.
 - a. Autotrophs are organisms that produce their own food.
 - b. Heterotrophs are organisms that obtain their food by consuming other organisms.

SECTION REVIEW 4.2

1. All food chains begin with producers.
2. corn, grasshopper, wren, hawk
3. The number of wrens and hawks might also increase. The amount of corn would decrease. The corn decrease could, in turn, cause a decrease in the number of grasshoppers.
4. The number of wrens would probably increase. In turn, the number of grasshoppers would decrease and the amount of corn would increase.
5. Because the food web of a diverse ecosystem is complex with many food connections, ecologists feel that it is more resistant to disturbance by natural disasters or interference by humans.
6. tropical rain forest
7. tundra
8. The increasing concentration of a pollutant in organisms at higher trophic levels in a food web is called biological magnification.

SECTION REVIEW 4.3

1. Less than 1 percent is absorbed by plants.
2. Biomass is the total amount of organic matter present in a trophic level.
3. Much energy is lost when organisms use it to generate heat and power movements.
4. An ecological pyramid is used to show energy, biomass, or the number of organisms in a food web.
5. Energy in most ecosystems comes from the sun.
6. Pyramids of energy, biomass, and numbers (population) show that the energy, biomass, and numbers at any trophic level are less than those of the trophic level below it.
7.
 - a. carbon
 - b. hydrogen
 - c. nitrogen
 - d. oxygen

SECTION REVIEW 4.4

1.
 - a. nitrogen
 - b. oxygen
 - c. carbon
2. Nitrogen is the most common element in the atmosphere at about 77%.
3. 65% of the human body is made up of oxygen.
4.
 - a. It evaporates from oceans, lakes, and streams.
 - b. It evaporates from plant leaves through transpiration.
5. Water evaporates from oceans, surface waters, and plants and enters the atmosphere as water vapor. Water vapor forms clouds, which then return water to oceans or to land in the form of precipitation.

Water that falls to land eventually makes its way to the ocean or other water sources, and the cycle continues.

6. Energy from the sun powers the water cycle.
7. Sources of carbon include: carbon in living organisms, carbon dioxide dissolved in the ocean, and carbon in rocks such as coal, oil, and limestone.
8. In the nitrogen cycle, nitrogen-fixing bacteria convert nitrogen from the atmosphere into nitrogen compounds that are readily available to plants. Plants use the nitrogen compounds to form essential proteins. Animals obtain the proteins they need by consuming plants. Decomposers return the nitrogen to the environment and the cycle begins again.

VOCABULARY REVIEW

1. L 2. F 3. B 4. G 5. J 6. D 7. C 8. H
9. E 10. I 11. K 12. A

CHAPTER 5

SECTION REVIEW 5.1

1. The species' niche is its role in the ecosystem.
2. Biotic factors, such as food sources and predators, and abiotic factors, such as temperature, amount of sunlight, amount of water, and time of day or night are all part of a niche.
3. a. When species try to share the same niche, they must compete for limited resources. The species better adapted to that niche would get more food, while the other species wouldn't get enough, which would result in the latter's being pushed out of that niche.
b. competitive exclusion
4. The fundamental niche is the niche that an organism could theoretically occupy. The realized niche is the niche that an organism actually occupies.
5. Predators limit the populations of their prey species, making resources available for other species. In effect, they enable more niches to exist.
6. Abiotic factors such as a high degree of variation in temperature and moisture contribute to niche diversity.

SECTION REVIEW 5.2

1. Evolution is the change in a population of organisms over time.
2. A specialized species occupies a narrow niche, meaning it is dependent on one particular food source. Warblers that eat insects in spruce trees and koalas that eat only eucalyptus are examples of specialized species.
3. A generalized species is one with a wide niche, meaning it often has several food sources.
4. Since generalized species have alternate food sources, they are capable of altering their behaviors in response to habitat disturbances.
5. The wings of birds and bats are one example of convergent evolution.
6. Coevolution is evolution in which species that interact closely are adapted to one another.
7. Caterpillars that have developed the ability to feed on poisonous plants, and acacia trees and the ant

colonies that live in them, are examples of species that have coevolved.

SECTION REVIEW 5.3

1. In reality, environmental conditions are seldom ideal and resources are usually limited. This limits population growth.
2. The carrying capacity for a species is the maximum number of organisms that can be supported indefinitely by an ecosystem.
3. The population stops growing, as the number of deaths and the number of births become equal.
4. Early population growth is exponential. Population growth slows as an ecosystem begins to reach its carrying capacity for the population. Population growth ceases at carrying capacity.
5. a. predation
b. disease
c. water availability
d. climate
e. human disturbance
f. natural disasters
6. Laboratory-raised fruit flies exhibit an S-shaped growth curve.
7. Insect populations, such as thrips, exhibit boom-and-bust curves.
8. Agriculture, technology, and medicine are factors in the exponential growth rate of the human population.

VOCABULARY REVIEW

1. J 2. E 3. H 4. B 5. A 6. G 7. F 8. C
9. D 10. I

CHAPTER 6

SECTION REVIEW 6.1

1. Some examples include snowshoe hare, mice, lemmings, and so on.
2. Some examples include praying mantis, snake, lynx, Arctic fox, and so on.
3. The number of prey available in any one year influences the number of predators that will live to produce offspring. If a large number of prey are available, the predator population will grow. This however, will cause a decrease in prey populations in following years, which will in turn affect predator populations.
4. Parasitism is a relationship in which one organism feeds on the tissues or body fluids of another.
5. The parasite population is closely connected to the size of its host population. Parasites thrive in crowded host populations because new hosts can be easily found.
6. Symbiosis is a relationship in which two species live together closely.
7. a. Some examples of parasitism are ticks and dogs, and tapeworms and humans.
b. One example of commensalism is barnacles and whales.
c. Some examples of mutualism are ants and the acacia tree, and the yucca plant and the yucca moth.



SECTION REVIEW 6.2

1. At first, soil forms from exposed rocks through the action of lichens and weathering. Then grasses and other small plants grow from seeds carried by wind. Eventually, the grasses become so dense that they crowd out the lichens. Shrubs eventually replace the grasses as the soil becomes deeper and richer. Shallow-rooted trees such as pines invade and are eventually replaced by hardwood forest. If left undisturbed, the hardwood forest will not change much over time.
2. Because fire does not destroy the soil, the first plants to colonize the habitat are fast-growing grasses and weeds. Then, as with primary succession, the grass community is followed by shrubs, fast-growing trees, and finally, the hardwood trees.
3. A newly formed lake or pond is low in nutrients and can support few organisms. Eventually, sediments from organisms collect at the bottom near the shore. Reeds and other water plants begin to grow, providing food for other organisms, which die and build more sediment. As the water becomes rich in nutrients, more organisms move in. Eventually, the sediments accumulate, forming a marsh. The marsh becomes a meadow which, through land succession, may become a forest.
4.
 - a. These organisms must have found a way to arrive on the island, either by water or air.
 - b. These organisms find little competition for resources because of the island's remoteness.



SECTION REVIEW 6.3

1. Some answers include: climate changes, natural disasters such as volcanic eruptions or disease, population changes, evolution, succession, and human activity.
2. One example is the evolution of mammals after the dinosaurs became extinct.
3. Scientists cannot predict how one change within the ecosystem will affect the whole ecosystem, since it is too complex. There are too many biotic and abiotic factors within an ecosystem to fully understand how ecosystems function.
4. Human activity is a major cause.
5. Responses will vary, but should include that equilibrium is a state of balance, and that although a healthy ecosystem is stable, it is not static; parts of an ecosystem are constantly changing and all changes and actions are counteracted.

SECTION REVIEW 6.4

1. A habitat refers to the environment in which a particular species lives, such as a log. A biome refers to a major ecosystem that has distinctive organisms, temperature, and rainfall.
2. The eight biomes are desert; tundra; coniferous, deciduous, and rain forests; steppe; prairie; and savanna.
3. Rain forests contain more than 50% of Earth's biomass. Destruction of this biome would alter Earth's climate.
4. The desert biome has the greatest range of temperatures.
5. The tundra biome is much colder with less range in temperatures than the desert biome. The tundra

also receives more precipitation than the desert biome.

6. This describes the prairie biome.
7. The tundra, desert, prairie, deciduous forest, coniferous forest, and rainforest biomes are all found in North America.

VOCABULARY REVIEW

1. biome
 2. symbiosis
 3. lichen
 4. secondary succession
 5. parasitism
 6. climax community
 7. primary succession
- scrambled letters: [ebncala] solution: [balance]

UNIT REVIEW 2

ECOLOGICAL INTERACTIONS

1.
 - a. Student illustrations should include producers at the first level, which pass energy to primary consumers and then to secondary consumers. Among consumers, there may be three or more trophic levels, each dependent on the one below it.
 - b. The sun supplies the original energy that is transferred to each trophic level in the ecosystem.
2. Biological magnification is greatest for those at the highest trophic level, such as humans, lions, eagles. Concentrations of pollutants in organisms increase with each step up in the trophic levels of an ecosystem.
3. First level: grasses, 1000 kg; second level: insects, 100 kg; third level: small birds, 10 kg; fourth level: birds of prey, 1 kg.
4. Convergent evolution is the development of similar adaptations in two species with similar niches; coevolution is evolution in which species that interact closely adapt to one another.
5. Food and water shortages could occur, resulting in famine. This would cause the population to decrease and eventually level off once the population reached its carrying capacity.
6. Students may name any area that recently experienced a volcanic eruption, such as the area around Mt. St. Helens.
7. 25% of Earth's land surface is desert, which is home to 1% of Earth's biomass.

CHAPTER 7

SECTION REVIEW 7.1

1. All deserts receive little precipitation during the year.
2. The lack of precipitation is the limiting factor of the desert biome.
3.
 - a. cacti
 - b. sage brush
 - c. aloe
 - d. mesquite trees
4. Cacti and other succulents can store water in their tissues. The spines of succulents have less surface area than do leaves, which means less water is lost

through transpiration. The mesquite tree has deep roots that tap into underground water sources.

5. Deserts found on the eastern sides of the western mountains such as the Sierra Nevada and Rocky Mountains, are cool deserts. The other main types of deserts, in Arizona, New Mexico, and western Texas, are hot deserts.
6. Desert biomes receive less than 25 cm of precipitation annually and have dramatic daily fluctuations in temperature.
7. Many desert animals are nocturnal because it is less difficult to hunt for food at night when air temperatures are cooler.

SECTION REVIEW 7.2

1. The northern desert belt is near the Tropic of Cancer (23° north latitude), and the southern desert belt is near the Tropic of Capricorn (23° south latitude).
2. Because the equator receives direct rays from the sun, temperatures are high, which causes rapid evaporation and makes the air very moist.
3. Once moisture in air falls over the tropics, the air becomes very dry. It flows toward the Earth's poles, becoming cooler and heavier. The dry, dense air sinks back to Earth's surface generating dry winds that cause the formation of deserts.
4. When winds force warm, moist air up and over a mountain, the air cools and drops its moisture as precipitation. As this dry air blows across the land on the other side of the mountain, it picks up moisture from the soil, but releases little rainfall, and thus forms a desert.
5. A semiarid region is one that is dry, but not as dry as a desert. It is capable of supporting grass and shrub communities.
6. Desertification is the process by which semiarid land changes into desert as a result of human activity.
7. Overgrazing of land by livestock can lead to desertification.

SECTION REVIEW 7.3

1. Nearly 10 percent of the Earth's surface is covered by tundra.
2. There is a lack of biodiversity in the tundra.
3. The limiting factor is low temperatures.
4. The tundra is extremely cold, with less than 25 cm of annual precipitation. Summer days are almost continuously light with cool temperatures.
5. Permafrost is the layer of frozen soil beneath the active zone. Since the permafrost never thaws, it causes summer rainfall to collect on the surface, forming bogs, marshes, and ponds. These serve as breeding grounds for certain insects—an important part of the tundra's food web.
6. Tundra plants tend to be small and grow low to get the warmth from the sun-heated ground. Because of the permafrost, the roots of plants are shallow.
7. Many animals are migratory, living on the tundra during months when food is more abundant. The permanent dwellers of this biome have such adaptations as thick coats of fur to trap air, and wide feet or hooves for walking on snow and ice.

VOCABULARY REVIEW

1. G
2. H
3. F, B
4. K
5. D
6. A
7. C
8. I
9. E
10. J

CHAPTER 8

SECTION REVIEW 8.1

1. A grassland is an ecosystem that receives more rainfall than a desert, but not enough to support a forest community.
2. The desert-grassland boundary is the area between the desert and the grassland where increased rainfall enables some grasses to grow. Long-term climate changes in the area can cause the boundary to become grassland or desert.
3. Grasses are the most common organism. Grasses are mostly roots and these are protected underground from fires and periods of drought.
4. Grass fires help to burn off the thick layer of dead grass that accumulates on the ground. This enables water, air, and nutrients to reach the soil and the new growth of grasses. Some grass seeds depend on both water and the fire's heat in order to reach the soil. Finally, grass fires destroy the trees and shrubs that have managed to take hold.
5. Many trees and plants have become drought resistant.
6. a. steppes
b. prairies
c. savannas

SECTION REVIEW 8.2

1. A steppe is a grassland that receives less than 50 cm of rain a year. It is characterized by short bunchgrasses.
2. A steppe gets more rainfall than a desert.
3. Steppes receive less than 50 cm of rain annually. High winds and high temperatures cause water to evaporate rapidly from the soil. Yearly temperatures range from -5°C to 30°C.
4. Prairies are grasslands characterized by rolling hills, plains, and sod-forming grasses.
5. Prairies receive more annual rainfall than steppes. Prairies support tall, sod-forming grasses that hold the soil together. These grasses prevent the soil from blowing away and provide humus to the soil, making the soil of the prairie more fertile than that of the steppe.
6. Bunchgrasses are short and grow in clumps. Clumping helps to hold water in a small area of roots, while the short, fine blades prevent water loss. The roots of these grasses are shallow, enabling them to absorb as much water as possible before it evaporates.
7. Migration, hibernation, and burrowing are some behavioral adaptations of steppe and prairie animals.

SECTION REVIEW 8.3

1. A savanna is a tropical grassland. It can range from dry scrubland to wet, open woodland.
2. Savannas typically have short rainy seasons, receiving up to 150 cm of rain, followed by long periods of drought.



3. A runner is a long underground stem. Plants with runners can recover quickly from grass fires and grazers, since they are protected underground.
4. Plants that grow rapidly recover quickly from damage done by fires and animals. Rapid growth also allows plants to make very efficient use of the water available during the rainy season.
5. Some organisms include elephants, gazelles, giraffes, pampas grass, rhinos, zebras, and wildebeests.
6. Thorns reduce the damage done by grazers.
7. It is an adaptation in which different animal species eat vegetation from different heights to avoid competition for food.
8. Some examples include elephants, giraffes, gazelles, and wildebeests.

VOCABULARY REVIEW

1. tufts
2. grasslands
3. sod-forming grasses
4. runner
5. vertical feeding pattern
6. prairie
7. humus
8. savanna
9. desert-grassland boundary
10. steppe
11. bunchgrasses

CHAPTER 9

SECTION REVIEW 9.1

1. Summers are generally warm and last two to five months. Winters are long and cold with fewer hours of daylight. Coniferous forests receive up to 200 cm of precipitation a year.
2. A conifer is a tree that produces seed cones.
3. Some examples include pine, hemlock, fir, spruce, and cedar.
4. Conifers have leaves that are needle-shaped with a waxy coating. Most conifers do not shed their needles at the same time of the year. Conifers have an overall triangular shape that helps them shed snow.
5. Snow insulates the ground and protects underground animals and the roots of trees from freezing.
6. Because the trees of the forest shade the forest floor, few plants can grow there. Fallen needles make the soils of the forest too acidic for most plants to grow in. Therefore, forest soils contain little organic matter.
7. Some organisms include ferns, lichens, mosses, mice, squirrels, moose, elk, deer, wolves, lynxes, bears, and a variety of birds.

SECTION REVIEW 9.2

1. A deciduous tree is one that sheds its leaves during a particular season of the year.
2. Deciduous forests are located in the temperate zone.
3. Temperatures vary greatly with the seasons from -30°C in the winter to 30°C in the summer. Precipitation falls year-round and can be as much as 300 cm annually.
4. Deciduous trees grow, produce, and store food in the six-month growing season. They shed leaves in autumn and become dormant. This enables the tree to conserve water. It uses stored food from its trunk, branches, and roots during the winter months.
5. People have cleared deciduous forests for use as farmland, because the soil is rich, and timber, because the trees have hard wood.

6. Although trees may be replanted, many of the species of plants and animals that made up the original ecosystem have disappeared from the area. These organisms would have to return. But because diversity in a replanted forest is low, some niches may no longer be present.

SECTION REVIEW 9.3

1. A rain forest is a biome characterized by a dense canopy of evergreen, broadleaf trees that receives at least 200 cm of rain annually.
2. Rain forests are located in the tropical zones surrounding the equator.
3. Temperatures in a rain forest are about 20°C year-round. They receive up to 450 cm of rain a year. In some rain forests, rain falls throughout the year, while in others, a wet season is followed by a dry season.
4. Because of the tree canopy, not much sunlight reaches the forest floor. Therefore, the forest floor can't support much plant life. Much of the organic matter that does reach the soil decomposes quickly and is used up by trees within weeks. All of this makes for poor soil.
5. The majority of organisms live in the trees of the rain forest.
6. Conditions in the canopy of the trees vary greatly from conditions at lower levels. As a result, there are many habitats among the different levels of vegetation to which organisms have adapted.
7. Deforestation is threatening the diversity of the rain forest. The destruction of each tree eliminates habitats for countless numbers of organisms.

VOCABULARY REVIEW

1. conifer
 2. rain forest
 3. deciduous
 4. deforestation
- Scrambled letters: freosst
Solution: forests

CHAPTER 10

SECTION REVIEW 10.1

1. An aquatic biome is one in which organisms live in or on water.
2.
 - a. the amount of dissolved salts in the water
 - b. the depth of the water
3.
 - a. saltwater biomes
 - b. freshwater biomes
4. The salinity of ocean water is about 30 parts per thousand, while the salinity of fresh water is 0.5 parts per thousand or less.
5. Brackish water is water that is less saline than ocean water and more saline than fresh water. Brackish water is located where fresh water meets ocean water, such as in river deltas and coastal marshes.
6.
 - a. Mono Lake
 - b. Great Salt Lake
7. Producers depend on sunlight to make food. The amount of sunlight that reaches the bottom of a body of water influences the number and kinds of plants that make up the base of the food web.
8. The photic zone has more living organisms since this zone has sunlight, which allows photosynthesis



to occur. The presence of a higher number of producers can support more consumers.

SECTION REVIEW 10.2

- Standing-water ecosystems include lakes, ponds, swamps, bogs, and marshes.
 - Flowing-water ecosystems include rivers and streams.
- Plankton drift in a pond or lake. They are eaten by small fish and insects.
- Wetlands, such as bogs, swamps, and marshes, are ecosystems in which the roots of plants are submerged under water at least part of the year.
- Wetlands act as filtering systems, contribute to the refilling of aquifers, and serve as breeding grounds for many waterfowl, insects, and other animals.
- Problems include: people have not appreciated the importance of preserving wetlands; wetlands often lie in desirable waterfront locations; there is no universal definition of a wetland.
- Alligators make large depressions in the mud with their tails. These holes, called "gator holes," become refuges for many aquatic animals during the dry season. Birds, in turn, depend on animals that live in the gator holes for food. Without alligators, many fish and birds would die.



SECTION REVIEW 10.3

- Some insect larvae have hooks they use to grab hold of plants. Others have suckers that anchor them to rocks.
- Most streams form at high altitudes from the runoff of melting snow at the tops of mountains.
- Gravity causes streams to flow from higher altitudes to lower altitudes.
- Headwater is water near the source of a stream. It is usually cold, rapidly flowing water with large amounts of dissolved oxygen.
- Small particles that settle at the bottom of a body of water are called sediments.
- As a stream meanders, erosion takes place along the fast-flowing outer edge of the stream. The inner edge of the stream moves more slowly, depositing sediment there. The stream becomes increasingly curved with time.
- People have dammed streams to form reservoirs and channeled water away from streams for irrigation. These actions result in flooding and water shortages, respectively, which disrupt or permanently change aquatic life there.

VOCABULARY REVIEW

- From the Latin *sedere*, "to sit," or "sink down."
- From the Greek *zoe*, "life," and from the Greek *planktos*, "drifting."
- From the Greek *benthos*, "depth," or "deep sea," and from the Latin *zona*, "belt."
- From the Greek *phot*, "light," and from the Latin *zona*, "belt."
- From the Latin *salinus*, "salt."
- From the Greek *phyton*, "plant," and from the Greek *planktos*, "drifting."

CHAPTER 11

SECTION REVIEW 11.1

- The oceanic zone is the largest horizontal zone. It ranges from 500 m along continental slopes to as deep as 11 000 m below the surface.
- The photic zone is about 100 meters deep.
- As with the desert biome, the biodiversity of the aphotic zone is severely restricted by certain abiotic factors. In the desert, biodiversity is limited by the small amount of rainfall. In the ocean's aphotic zone, biodiversity is limited by lack of sunlight.
- Detritus is pieces of dead organic material that rain down from surface water to deeper water. Many organisms at the base of the aquatic food chain and in the aphotic zone feed on detritus.
- Oceans vary by their salinity, temperature, and density. Waters near the equator are warmer and more saline with a higher mineral content compared to waters farther from the equator. Waters near the poles are colder, less salty, and denser than waters nearer the equator.
- Currents are masses of water flowing in characteristic patterns.
- Ocean currents are driven mostly by winds. However, density differences due to salinity and temperature also influence currents.

SECTION REVIEW 11.2

- The continental shelf is the shallow waters that surround the continents.
- The neritic zone accounts for 8 percent of the ocean.
- coral reefs
 - estuaries
- Coral reefs are important in that they are the breeding and feeding grounds for fish eaten by people. Reefs also protect the shoreline from erosion. Some reef organisms secrete chemicals that may have medicinal value.
- Rapid deaths of corals occur when silt, sand, topsoil, or toxic chemicals wash into the water. For this reason, a coral reef can serve as an indicator of water quality.
- An estuary is a partly enclosed region of water in which a freshwater source meets salt water from the ocean.
- The availability of sunlight throughout the zone, high mineral and nutrient content of the water, and a fresh supply of oxygen from tidal action all contribute to the productivity of this zone.

SECTION REVIEW 11.3

- The intertidal zone is the region of shoreline that alternates between periods of exposure and periods of submersion twice each day.
- salt marshes
 - mangrove swamps
- Many migratory bird populations feed and rest in salt marshes. Plants, which grow in abundance in salt marshes, die and wash into the surrounding estuary, enriching it for marine animals that breed there.
- As streams flow into the calm waters of an estuary, they deposit sediments. Sediments build up over time, forming a delta. The accumulated sediments sink under water from their own weight.

5. Mangrove trees have roots that grow above the water's surface in order to obtain oxygen not supplied by the water.
6. Some reasons include coastal building construction, waste dumping, and the development of culture ponds for raising fish and shrimp commercially.

VOCABULARY REVIEW

1. oceanic 2. neritic zone 3. continental shelf
 4. reef 5. marshes 6. intertidal zone
 7. detritus 8. estuary

Scrambled letters: ocesncsemsaot

Solution: ocean ecosystems

UNIT REVIEW 3

1. Students should consider adaptations for extreme temperature ranges and lack of water.
2. Diagrams should indicate that on one side of a mountain range, water evaporates. The air cools and drops precipitation as it rises above the mountains. As dry air reaches the other side of the mountain, water from the soil evaporates into the air.
3. Each year, land about the size of Maine becomes desert. Eventually, little tillable land will be left for growing food. Desertification will lead to climate changes and famine.
4. Since reptiles are cold-blooded animals, they are unable to maintain their body temperatures in the frigid tundra.
5. People farmed and overgrazed the areas where grasses once grew and depleted the soil's organic matter and destroyed its structure. People destroyed the herds of bison, prairie dogs, and other animals necessary to maintaining the grassland.
6. Students' drawings should include a layer of tall, mature trees (canopy), a layer of younger, smaller trees (understory), and a layer of shrubs, mosses, ferns, and herbaceous plants (forest floor).
7.
 - a. The top layer, the photic zone, is the layer that receives sunlight. Most aquatic organisms are found in this layer.
 - b. The second layer, the aphotic zone, receives no sunlight.
 - c. The floor of the ocean, the benthic zone, is at the bottom of the aphotic zone. It supports organisms that derive nutrients from chemical energy from vents in the ocean floor and detritus.
8. The fishing industry has a strong interest in ocean currents since fish and other ocean organisms follow the pattern of the currents. Currents also influence weather patterns, so anyone interested in weather outcomes is interested in changes in the ocean's currents.
9. Just as rain forests make up a small percentage of land biomes, neritic ecosystems make up a small percentage of the marine biome. Even so, the rain forest and neritic ecosystems have the most biodiversity of all land and all aquatic biomes, respectively.

SECTION REVIEW 12.1

1. a. Plate tectonics, ocean circulation, climate, and ecosystems are four systems of the Earth.

- b. All of the systems of the Earth are connected because they all have effects on each other. For example, a shift in a plate can change the movement of the ocean. This can change climate, which can, in turn, affect ecosystems.
- c. Energy from the sun powers many of Earth's systems.
2. The formation of clouds, the movement of ocean currents, and the growth of plants and animals are powered by the sun's energy.
3. The industrial view of nature separates humans from the rest of nature and includes the belief that nature is something to be exploited. The Gaia hypothesis contends that Earth is a single living unit that regulates itself to maintain life. People are part of this living unit, not separate from it.
4. The hypothesis is controversial. But scientists are beginning to look at the connections between Earth's different systems and are coming to view Earth as a whole.

SECTION REVIEW 12.2

1. The hunter-gatherer society impacts the environment least. This type of society has a low population density and a nomadic lifestyle. Peoples in this society use only a small amount of the resources of an area and move on, giving the area a chance to regenerate.
2. Farming brought permanent settlements. It also increased the food supply enough so that not all members of the society needed to farm. Some people could engage in work other than farming.
3. Agricultural societies cause populations to increase and, in turn, cause the natural resources of an area to decrease more rapidly with little or no chance for regeneration. Also, overgrazing and poor farming practices lead to loss of soil and vegetation, which leads to changes in rainfall patterns.
4. An industrial society is one in which the production of food and other products is performed by machines.
5. Increased food supply and improved medical care have enabled people to live longer and produce more children.
6. Some answers include overuse of soil, depletion of natural resources, and pollution.

SECTION REVIEW 12.3

1. It is the new ethic of the environment that takes into account the current needs of society without limiting the ability of future generations to meet their needs.
2. The frontier ethic contends that resources are unlimited and meant for human consumption. It also holds that humans are apart from nature, do not obey natural laws, and must control the natural world. These standards are unreasonable in view of what we now know about Earth. Resources are finite because Earth's size is limited. Consumption of resources by humans has a direct impact on all organisms. Like other organisms, humans are a part of nature and must follow its laws, for the Earth has a carrying capacity and all organisms are



affected by limiting factors.

3. Sustainable development relies on reducing our use of nonrenewable resources by recycling, conservation, and shifting over to renewable energy sources.
4. A society based on this ethic should survive indefinitely because it is based on renewable resources and doesn't cause irreparable damage to the environment that sustains it.
5. Examples include wood, animals, plants, and water.
6. Examples include coal, oil, natural gas, and minerals.

◎ VOCABULARY REVIEW

1. F 2. B 3. G 4. D 5. E 6. A 7. C

CHAPTER 13

◎ SECTION REVIEW 13.1

1. Malthus thought population was growing geometrically, but the food supply was increasing arithmetically. Consequently, the human population would eventually outgrow its food resources. This would result in war and famine.
2. The birth rate and the death rate both affect population growth, since increased birth rates and/or decreased death rates increase the size of a population.
3. During the period of the agricultural revolution, people settled into farm communities and abandoned the hunter-gatherer lifestyle. Food production increased, allowing the human population to grow.
4. The coming of the industrial revolution allowed for vastly increased food production and distribution, which made it possible to feed more people. Modern medicine eliminated many diseases, causing the death rate to decline.
5.
 - a. This theory holds that bacteria and microorganisms are the agents responsible for many diseases.
 - b. As a result of the germ theory, people made improvements in hygiene, waste disposal, and water treatment. They began to practice sterile surgical techniques. These developments decreased the death rate.
6. Some examples include famine and war.

◎ SECTION REVIEW 13.2

1.
 - a. Society can use it to anticipate the needs of future populations, such as food, jobs, housing, energy, and transportation.
 - b. Scientists and urban planners are some people who use this information.
2. You determine the growth rate by subtracting the number of deaths per one thousand people from the number of births per one thousand people.
3. Doubling time is the amount of time it will take a population to double, at a given rate of growth.
4. Many factors such as war, famine, disease, changes in technology, and changes in human reproduction patterns can alter the doubling time of a population. Immigration and emigration are also important factors.
5. Demography is the science of the changing vital statistics in a human population, such as age, gen-

der, education, and wealth.

6. Industrialized nations, by definition, have a lot of industry, which relies on large amounts of usually nonrenewable energy resources. The lifestyles of people in industrialized nations also require a lot of energy use: more people own cars, use electrical appliances, etc.

◎ SECTION REVIEW 13.3

1. Overpopulation places greater demands on space and resources. It contributes to health problems, pollution, and the destruction of the habitats of other organisms.
2. Getting families to limit their size is difficult for many reasons. These reasons include religious beliefs, personal desires for children, cultural beliefs, and the difficulty of educating people about birth control.
3. When fewer children are born, there are fewer young people in the population relative to older people. This can weaken the economic and military strength of a nation.
4. New sources of energy may be produced, and new crops may be developed through genetic engineering. These and other scientific breakthroughs may help to relieve some of the conditions brought about by human overpopulation.
5. Historically, advances in technology have led to increases in populations. Many scientists feel that Earth has a carrying capacity that will be reached in the near future.

◎ VOCABULARY REVIEW

1. agricultural revolution 2. famine 3. census
4. germ theory 5. doubling time 6. death rate
7. bubonic plague 8. demography
Scrambled letters: uvinetolaropop
Solution: overpopulation

CHAPTER 14

◎ SECTION REVIEW 14.1

1. Nutrients include macronutrients and micronutrients.
2. A kilocalorie is a unit of energy provided by macronutrients.
3.
 - a. A carbohydrate is a compound of carbon, hydrogen, and oxygen in about a 1:2:1 ratio.
 - b. Fruits, vegetables, bread, and grains are high in carbohydrates.
4. Proteins provide essential amino acids that the human body cannot produce. Without these amino acids, the body cannot replace blood, muscle, and other tissues.
5. There are many health risks associated with a diet high in fat, including heart disease.
6. Vitamins and minerals are essential in the biochemical reactions that release energy from food.
7. Malnutrition is possible in people whose diets supply them with sufficient energy. It is caused by some specific nutrient lacking in the diet such as a vitamin.
8. Some diseases include scurvy, beri beri, and rickets.
9. Micronutrients are lost through cooking, processing, and storing plant foods.



SECTION REVIEW 14.2

1. The term refers to the development of new strains of wheat and rice during the mid-1960s. These crops are fast-growing, more resistant to disease, and are adaptable to many climates.
2. The Green Revolution has not helped the underfed nations because their farmers often lack the water, machinery, and fertilizers to grow enough wheat and rice to be profitable. In addition, the abundance of crops produced by the developed nations of the world has driven the market price of grains down, causing farmers of developing countries to receive even less for their crops.
3. A cash crop is one that is grown for the purpose of export sale.
4. Exported crops can produce more profit than crops grown for local consumption. Consequently, the desire for profit may drive people to use more land for cash crops, rather than for feeding local populations. This practice contributes to hunger in local populations.
5. Aquaculture is the commercial production of fish in a controlled, maintained environment.
6. The populations of fish in the open ocean have begun to drop due to overfishing. Aquaculture is an alternative to fishing in the open ocean.



SECTION REVIEW 14.3

1. Some answers include the current use of heavy, fuel-driven farm machinery, the wide use of chemical fertilizers and pesticides, the trend toward growing one or two crops instead of a variety of crops, and the abandonment of the practice of leaving some fields fallow.
2. Many small family-run farms have gone out of business because they cannot afford to compete in the marketplace with the larger commercial farms.
3. Agribusiness refers to large corporations that are responsible for growing most of the crops and for producing most of the chemical fertilizers and pesticides used in the United States.
4. Some problems include damage to the ecosystem due to pesticide use, an increase in pests that have become resistant to pesticides, depletion of minerals from the soil due to growing the same crop repeatedly, and damage to the soil from heavy machinery.
5. The older varieties are better adapted to certain areas and have natural resistance to disease and pests.

SECTION REVIEW 14.4

1. Sustainable agriculture is a method of farming based on crop rotation, reduced soil erosion, pest management, and a minimal use of soil additives.
2.
 - a. Crop rotation involves changing the type of crop grown in an area on a regular cycle.
 - b. Crop rotation helps keep the soil from becoming depleted of minerals.
3. Topsoil contains organic matter and mineral nutrients needed by plants to grow. Loss of topsoil makes a field useless for farming.
4. Erosion may be reduced by irrigation that does not wash away soil, and by good soil management, which includes planting cover crops and limiting

tilling .

6. IPM, or integrated pest management, is a new approach to managing pests. It is based on curtailing the use of pesticides and allowing natural predators, such as ladybug beetles, wasps, and a variety of viruses and bacteria, to control insects that harm crops.

VOCABULARY REVIEW

1. From the Latin *carbo*, “ember, charcoal,” and from the Greek *hydor*, “water.”
2. From the Greek *protos*, “first.”
3. From the Greek *lipos*, “fat.”
4. From the Middle French *mal*, “bad,” and from the Latin *nutrire*, “to nourish.”
5. From the Latin *aqua*, “water,” and from the Latin *cultura*, “cultivation.”
6. C 7. B 8. D 9. A

UNIT REVIEW 4

1. Industrial society came about because humans were successful in devising ways to efficiently produce and distribute large quantities of food and other products to a growing population. This helped bring about an explosion in population growth over the last 300 years. However, this ever-growing population is causing more and more destruction to the environment, which may mean that soon we will no longer be able to meet all of our needs.
2. A renewable resource is one that regenerates quickly, such as wind or water power. A non-renewable resource, such as fossil fuels, regenerates slowly, if at all.
3. Outlines should include the storing of food and permanent settlements in the first period, the development of farming skills and domestication of animals during the agricultural revolution, and technological advances and improved health care during the industrial revolution.
4. Students should mention war, famine, and disease.
5. Reasons to control population growth include limiting demands on space and resources, reducing the threat of health problems and pollution, and slowing the destruction of the habitats of other organisms. One reason to not control population growth is that it might weaken the economic and military strength of nations as populations become increasingly old. Another reason is that it conflicts with certain personal, religious, and cultural values.
6. Some answers include clams, oysters, lobsters, shrimp, and trout.
7. The ideal organic farm would be one that has limited tilling, employs crop rotation, and uses cover crops and other natural fertilizers. There would be no use of pesticides, because natural predators would limit the populations of pests that harm crops.

CHAPTER 15

SECTION REVIEW 15.1

1. Forms of energy include heat, light, electricity, mechanical energy, chemical energy, and nuclear energy.
2. Fuel is burned to boil water and produce steam. Pressure exerted by the steam is used to turn tur-

- bines. The rotating turbines produce electricity.
- Organic fuels are fuels that contain carbon compounds that were once part of organisms.
 - A hydrocarbon is a compound composed only of hydrogen and carbon.
 - Methane, ethane, octane, and iso-octane are three kinds of hydrocarbons.
 - A fossil fuel is one derived from the remains of organisms that lived long ago.
 - It comes from energy from the sun that was converted to chemical energy that remained stored in the cells of plants and animals when they died.
 - Coal, petroleum, and natural gas are fossil fuels.

SECTION REVIEW 15.2

- As plants died, their remains accumulated and became covered by sediments. Over millions of years, the heat and pressure of the weight of these layers of sediments caused chemical changes in the plants and forced water out of them. These processes changed the plant material to coal.
- Lignite is a soft, brown coal composed of about 40 percent carbon.
 - Bituminous coal is a soft coal composed of up to 85 percent carbon.
 - Anthracite coal is a hard coal composed of up to 95 percent carbon.
- Peat is a brittle, brown plant material that is the first stage in the formation of coal.
- Peat contains a low percentage of carbon and gives off a large quantity of smoke.
- Peat, lignite, bituminous coal, and anthracite coal are the stages of coal formation.
- Anthracite coal is best for fuel since it burns the hottest with the least amount of smoke.

SECTION REVIEW 15.3

- Coal is a solid fuel; petroleum is a liquid fuel; and natural gas is a fuel in the gaseous state.
- Scientists think that petroleum formed from the remains of sea organisms millions of years ago. They settled to the bottom of the ocean where they were covered by sediments. The pressure of the accumulated sediments converted the remains into the liquid we call petroleum. The liquid seeped into the pores and cracks of sedimentary rocks.
- Wells are drilled into the pools of trapped fuel. Pressure forces the oil to the surface. Sometimes, however, the oil must be pumped out.
- Petroleum is used for transportation, heating homes, producing electricity, and in the making of many nonfuel products, such as grease, asphalt, and synthetic fabrics.
- Natural gas is made up of methane, ethane, and propane, and trace amounts of hydrogen sulfide, nitrogen, and helium.
- Natural gas is often found trapped above petroleum in rocks.
- Natural gas does not have to be converted to electricity. It is used as a fuel directly.

SECTION REVIEW 15.4

- One major problem associated with using fossil fuels is that they are not renewable. This means that fossil fuels will not always be available. The second problem is the environmental damage and pollution that occur when fossil fuels are extracted, transported, and burned.
- The burning of fossil fuels results in air pollution. Furthermore, many scientists believe that the increased levels of carbon dioxide in the atmosphere contribute to global warming in a process called the greenhouse effect. Carbon dioxide is a by-product of burning fossil fuels.
- A biomass fuel is a fuel formed from the products of living organisms.
- Sources of biomass fuels include wood, garbage, methane, and alcohol.
- Biomass fuels are a renewable resource.
- Examples include the conversion of plants such as sugarcane, corn, sunflowers, and peanuts to various forms of alcohol.

VOCABULARY REVIEW

1. K 2. G 3. D 4. E 5. A 6. H 7. J 8. I
9. F 10. C 11. L 12. B

CHAPTER 16

SECTION REVIEW 16.1

- The cluster of protons and neutrons in the center of an atom is called the nucleus.
- The number of protons in the nucleus of an atom determines its properties.
- The number of protons and the number of neutrons make up the mass number of an atom.
- isotopes
- An element that emits particles and energy from its nucleus as it decays is radioactive.
- H-2, H-3, and U-235 are examples of radioactive elements.
- In the process of radioactive decay, an atom emits alpha or beta particles. This changes an atom's atomic number and makes it a different element.

SECTION REVIEW 16.2

- Nuclear fission is a reaction in which the nucleus of a large atom is split into smaller nuclei.
- U-235, a uranium isotope, is used most commonly in fission reactions.
- The fall of the first domino causes all of the other dominoes to fall one by one, just as the action of one nucleus splitting apart releases neutrons that cause other nuclei to split apart.
- The neutrons emitted in the fission reaction contain some of the missing mass, while the rest of the mass is converted to energy.
- Too many fission reactions generate too much heat until they eventually cause a meltdown in the nuclear reactor's core. When this happens, radioactive materials are released into the environment.
- Heat produced from chain reactions in the reactor is carried via pipes to a heat exchanger. There, it heats water for steam used to turn the turbines of an electric generator.
- A breeder reactor is a reactor that produces fission-



able fuel as it works.

SECTION REVIEW 16.3

1. Some health risks include skin burns, cancer, death, and changes to DNA that cause birth defects.
2. Some sources of radioactive wastes include used uranium fuel rods, control rods, and the water used to cool the chain reactions; mine wastes from uranium mines, and contaminated clothes of power plant workers; and wastes produced by hospitals and laboratories.
3. Plutonium will remain dangerous for 200,000 years.
4. Because the half-life of many medium- and high-level wastes may be thousands of years, the containers must not corrode. Choosing the proper material for containers is difficult. Choosing storage sites that will remain geologically stable for thousands of years is also difficult. Finally, the cost of transporting and storing radioactive materials is very high.
5. Burying low-level wastes or encasing them in cement and dropping them into the ocean are not permanent solutions, and these methods expose the environment to contamination.
6. Responses will vary. A possible response may be: no matter how safely a plant is designed, the element of human error is always present, and a repetition of this disaster is always possible.



VOCABULARY REVIEW

1. F 2. G 3. B 4. E 5. A 6. H 7. C 8. D

CHAPTER 17

SECTION REVIEW 17.1

1. The energy in fossil fuels is stored energy in the remains of organisms whose energy came from the sun. The sun drives the water cycle that brings water to rivers. This water is used to supply electrical energy. The sun is also responsible for temperature variations, which cause winds.
2. The sun gets energy from thermonuclear fusion.
3. Some advantages of solar energy are that it is free, clean, and nonpolluting. However, sunlight is not constant and the equipment used to store solar energy is expensive and not very efficient.
4. In passive solar heating, energy from sunlight is used directly as a heat source when it is collected, stored, and distributed in an enclosed dwelling. A house can maximize passive solar heating if it has large windows on the side that gets the most sunshine, is built out of light-absorbing materials such as stone, brick, and concrete, and has glass-enclosed areas.
5. Active solar heating makes use of devices to collect and distribute the sun's energy. Flat-plate collectors, tubes, tanks, fluids, pumps, and fans are some devices used in active solar heating.
6. It is a device that uses thin wafers of semiconductor material to produce electricity directly from solar energy.
7. PV cells are lightweight, produce no wastes or pollution, have no moving parts, consume no materials, and are long-lasting.

SECTION REVIEW 17.2

1. The energy from moving water can be used to turn an object, such as a waterwheel or the blades of a large turbine. Also, it can be used to produce electricity.
2. Hydroelectric power is nonpolluting, readily available in many areas, and cheaper than using fuels to produce electricity.
3. A dam is used to collect water so that the flow of water may be controlled and used to produce electricity.
4.
 - a. Dams provide a means for producing electricity, flood control, recreation in the lakes formed behind the dams, and water storage for use by towns and for irrigation.
 - b. Disruption of the plant and animal life and their life cycles upstream and downstream of the dam, flooding, and shoreline erosion are some disadvantages of dam construction.
5. Some concerns include possible damage to wetlands and to the community on the ocean floor around the generator.

SECTION REVIEW 17.3

1. In traditional aerogenerators, propeller-like vanes turn at great speeds on a horizontal axis. As the vanes turn they produce electricity in a generator similar to those used at hydroelectric plants. The second type of aerogenerator turns on a vertical axis and can produce electricity at lower wind speeds than the traditional type.
2. A wind farm is a place where many aerogenerators are placed together.
3. Wind farms are located in large, open areas where wind conditions are favorable.
4. Birds may be injured when they fly into the spinning vanes of the aerogenerators. Wind farms take up a lot of space and are considered unsightly, especially since they are often placed in natural landscapes.
5. Answers will vary but should reflect an understanding of such factors as land and wind availability, cost effectiveness, environmental impact, and so on.

SECTION REVIEW 17.4

1. Geothermal energy is heat energy generated deep within Earth.
2. The decay of radioactive elements deep beneath Earth's surface gives off heat, which is called geothermal energy.
3. Geothermal energy has been used to generate electricity and to heat homes and greenhouses.
4. Geothermal areas are not easy to locate; the air around these areas is often polluted by toxic gases; waste products such as minerals, salts, and toxic metals corrode equipment; there is often an inadequate supply of water for steam production; and the process is not always cost effective.
5. Nuclear fusion is a source of energy that involves fusing two atomic nuclei so that they become one larger nucleus.
6. Theoretically, much less radioactive waste is produced than by traditional nuclear fission reactors, and the fuel needed in the process is abundant in nature and easily obtained.

VOCABULARY REVIEW

1. from the Latin *solaris*, "sun," and from the Greek *energōs*, "active."
2. from the Greek *phōtōs*, "light," and from the Italian *voltare*, "to turn."
3. from the Greek *hydōr*, "water," and from the New Latin *electricus*, "produced from amber by friction."
4. from the Greek *aērōs*, "air," and from the Latin *gener-*, *genus*, "birth."
5. from the Greek *gē*, "earth," from the Greek *thermē*, "heat," and from the Greek *energōs*, "active."
6. from the Latin *fusus*, "spindle."

UNIT REVIEW 5

1. Because fossil fuels take millions of years to form, they are not a renewable source of energy. Fossil fuels are in limited supply, and world demand may deplete the supply shortly. Fossil fuels can also be very damaging to the environment.
2. Many answers are possible but may include lowering thermostats, curtailing the use of electrical appliances and increasing the use of manual appliances, carpooling, designing homes and appliances that are more energy-efficient, designing cars that operate on alternative energy sources, using renewable energy sources, and so on.
3. The conversion of organic materials into fuels is called bioconversion.
4. The advantage is that electricity can be produced cheaply and without the use of fossil fuels. However, the wastes produced by nuclear reactors remain radioactive for tens of thousands of years and are not being disposed of safely.
5. Students' drawings should be similar to the one on page 253.
6. The threat posed by low-level wastes might be greater than that of high-level wastes because low-level wastes are more common.
7. Some examples include solar energy, hydroelectric power, wind energy, geothermal energy, and nuclear fusion.
8. In nuclear fission, the nucleus of an atom is split into smaller nuclei. In nuclear fusion, two atomic nuclei fuse to become one larger nucleus. In both nuclear fission and nuclear fusion, large amounts of energy are released.

CHAPTER 18

SECTION REVIEW 18.1

1. Gold is a mineral composed of only one element.
2. One example is quartz, which is made of silicon and oxygen.
3. Ores are rocks or minerals that contain economically desirable metals or nonmetals. An example is hematite, which contains iron.
4. Ductility, malleability, and the ability to conduct electricity and heat are properties that make metals useful.
5. Some examples include sulfur for car batteries, gypsum for concrete and wallboard, halite for table salt.
6. Political unrest and military conflict in a country that exports metals can cause a decrease or cessa-

tion in the supply of metals to importing nations. This drives up the price of metals and has great economic impact on importing nations.

SECTION REVIEW 18.2

1. Core samples, aerial photography, and satellite imagery are methods used to locate minerals.
2. Some kinds of damage include the removal of topsoil and vegetation, pollution from the exhaust that is emitted by machinery used to extract and process minerals, possible disturbances in aquatic food chains as a result of dredging, and pollution from spoil piles to ground and surface water.
3. Recycling, substitution, and reuse are some alternatives to mineral extraction.
4. Aluminum and other metals can be recycled. The use of silicon for glass fibers may be substituted for copper in transmitting telephone signals. Aluminum pie tins and other metal containers used in packaging foods may be reused rather than discarded.

SECTION REVIEW 18.3

1. Weathering is the breaking down of rock into smaller fragments.
2. The two types of weathering are mechanical and chemical.
3. Soil is a mixture of mineral particles, bedrock, air, water, and living and decaying organisms.
4. Mechanical and chemical weathering change the structure of bedrock. Initially, cracks and holes form in the rock from chemical weathering by air and water, breaking rock apart. Plants and animals contribute to the mechanical weathering of rock by growing in it and burrowing in it. When organisms die, they contribute humus to the soil. This process of soil formation may take hundreds or even thousands of years.
5. Sandy soils are those with particles from 0.05 mm to 2.0 mm in diameter. Clay soils are those whose particle size is smaller than 0.002 mm. Loam soils are soils that are equal parts clay, sand, and silt, and so, have a variety of particle sizes. Sandy soils are fast-draining; clay soils are slow-draining. Loam soils provide healthy drainage and good pore space for air.
6. Climate is the most important factor because the amount of precipitation, wind, and temperature all influence the rate at which rocks weather.

SECTION REVIEW 18.4

1. Mining, construction, and agriculture all bring about removal of large areas of vegetation.
2. Soil organisms aerate the soil, keep it soft and loose, and add organic matter to it. Some organisms help in the decaying process of plant and animal matter and play a role in the making of soil itself.
3. Chemical fertilizers, pesticides, salts, and exhaust from cars and factories enter the soil, and in high enough concentrations, kill some of the organisms living in it.
4. Soil compaction is caused by the traffic of motor vehicles, farm animals, and heavy farm and con-



- struction machinery pushing down on soil.
- Soil erosion, soil compaction, soil infertility, and the buildup of sediments in streams and lakes are some eventual outcomes of soil mismanagement.

VOCABULARY REVIEW

- soil
- parent rock
- ore
- soil profile
- bedrock
- mineral
- reuse

Scrambled letters: seresocru

Solution: resources

CHAPTER 19

SECTION REVIEW 19.1

- Solid wastes are the breeding grounds for many disease-causing organisms. Outbreaks of typhoid and cholera have been the result of poor sanitary conditions.
- About 70% of today's garbage goes into landfills.
- Some problems include garbage washing up onto beaches, and water pollution.
- A landfill is a site where wastes are buried.
- Landfills attract populations of rats, insects, and other unwanted organisms. Foul odors are emitted from decaying garbage, and toxic substances leach into groundwater systems.
- Some advantages include the use of methane gas for generating electricity, and the use of the landfill for recreational purposes once the landfill is closed.



SECTION REVIEW 19.2

- Property damage from fires and explosions, birth defects, cancer-related illnesses, disabilities, lung damage, and death are just some dangers of hazardous wastes to humans.
- Categorizing hazardous wastes helps determine specific methods for disposal.
- Reactive wastes: sodium;
 - corrosive wastes: battery acid and lye;
 - ignitable wastes: paint thinners, oils, and some cleaning fluids;
 - toxic wastes: arsenic, cyanide, mercury, and some pesticides.

Other possible answers are: radioactive wastes: uranium, mining wastes around uranium mines, and protective clothing, tools, and equipment used in nuclear power plants; medical wastes: lab equipment, lab specimens, used syringes and blood vials; hazardous home wastes: ammonia, bleaches, toilet bowl cleaners, oven cleaners, disinfectants, and others.

SECTION REVIEW 19.3

- Weathering forms new soil while erosion carries soil away.
- Wind and running water are the major causes of erosion.

- Overgrazing, deforestation, irrigation, and cultivation lead to soil erosion.
- About 4 billion metric tons of topsoil are lost each year in the United States due to wind and water erosion.
- Strip-cropping involves plowing alternating strips of land to leave part of the land protected by vegetation.
- Slopes are plowed along the contour of the slope so that the furrows between rows of crops collect water and prevent soil erosion.
- Terracing is used on steep slopes.
- Shelter belts are rows of trees along outer edges of fields that act as windbreaks to reduce wind erosion.

SECTION REVIEW 19.4

- About 25% of landfill wastes are disposable items.
- People could substitute reusable goods for disposable items, substitute recyclable goods for disposable items, repair broken appliances, and compost plant and vegetable wastes.
- A biodegradable material is one that decomposes easily and enriches the soil.
 - Grass clippings, garden wastes, leaves, branches, and vegetable food wastes.
- Superfund is a law passed by Congress to protect communities from the dangers of hazardous waste materials.
- Some methods of disposing of hazardous wastes include burying them in secure chemical landfills, burning them in controlled incineration, injecting them into deep porous rocks, neutralizing them in treatment plants, selling them to other companies, and encasing radioactive wastes in concrete vaults and placing them underground.
- The United States and European countries ship their wastes to developing countries because of the high cost of disposal and the lack of available disposal sites at home.
- A reduction in the production of hazardous wastes and the development and widespread use of cleaner technologies are needed to help alleviate the problem of hazardous waste disposal.

VOCABULARY REVIEW

1. F 2. A 3. D 4. C 5. B 6. E

CHAPTER 20

SECTION REVIEW 20.1

- Fresh water is an important resource and its availability is limited.
- 300 L of water is used daily by the average person in the United States.
- Water is used to transport goods, to dispose of wastes, and to generate power. It is used in mining, refining, and manufacturing, and also as a coolant.
- The agricultural industry is the single largest user of water. Most of the water is used for irrigation.
- Flood irrigation is inexpensive but wasteful, since more than half of the water is lost to evaporation. Furrow irrigation is more efficient than flood irrigation, but the evaporation rate is still high and mineral salts accumulate quickly. Overhead irrigation

systems are very efficient, but sprinkler systems lose efficiency in strong winds and drip systems are expensive. Subirrigation is effective in places where underground water sources are near the surface.

6. Building dams, draining swamps, changing the course of streams, and removing water from natural sources destroy or alter the habitats of other living things.

SECTION REVIEW 20.2

1. Surface water is water above the ground in streams, lakes, and ponds.
2. Some sources of surface water include rainfall; water from melting snow, glaciers, and ice sheets; and water from aquifers that comes to the surface.
3. Water that does not seep into the ground is called runoff.
4. Water that does not run off seeps down through the spaces between soil particles. If the bedrock beneath the soil is porous or has cracks, the water seeps into the bedrock.
5. The zone of saturation is another name for an aquifer.
6. The amount of precipitation, the porosity of the rocks, and the slope of the aquifer determine the rate at which water in an aquifer moves.
7. Overdraft is what occurs when a body of water is depleted faster than it is refilled.
8. Weakening of the bedrock due to a drop in the water pressure in the aquifer causes subsidence. A drop in water pressure also causes salt intrusion in aquifers near coastal areas.

SECTION REVIEW 20.3

1. Penguins have special glands that remove the salt, whereas humans do not.
2. Desalination is the process by which salts are removed from water.
3.
 - a. Distillation—Water is boiled and evaporated, leaving behind the salt. The water vapor is then cooled and the fresh water is collected.
 - b. Reverse osmosis—Water is passed through a thin membrane with tiny pores that trap the salt in the water.
 - c. Freezing—Most of the salt separates from the frozen water, which is then melted for use as fresh water.
4. All of the methods are very expensive.
5. Sedimentation, filtration, aeration, and sterilization are methods used to purify water.
6. Some agents used to purify water include air, chlorine, and ozone.
7. Water purification removes harmful chemicals and microorganisms that make water unpotable.

VOCABULARY REVIEW

1. aeration
2. groundwater
3. furrow
4. overdraft
5. water table
6. desalination

Scrambled letters: igroartini

Solution: Irrigation

CHAPTER 21

SECTION REVIEW 21.1

1. Water pollution, disease, and disturbance of the ocean ecosystem are problems caused by ocean dumping.
2. Toilets, sinks, dishwashers, washing machines, and industrial processes are sources of sewage.
3. The purpose of a sewage-treatment plant is to filter out pollutants in waste before it is returned to surface-water systems.
4. Pathogens are parasites, bacteria, and viruses that cause diseases in living things.
5. Bacteria that cause typhoid fever and cholera, and worms that cause schistosomiasis, are some pathogens found in water.
6. Pathogens, nutrients, sediments, and toxic chemicals are some common water pollutants.
7. Agriculture, sewage plants, industry, urban runoff, mining runoff, and construction runoff are the sources of water pollution.

SECTION REVIEW 21.2

1. Toxic chemicals are elements and molecules that are directly harmful to living things.
2. Organic chemicals are molecules based on atoms of carbon; inorganic chemicals are not.
3.
 - a. Heavy metals are metallic elements with high mass numbers.
 - b. Mercury, cadmium, arsenic, nickel, and chromium are some heavy metals.
4. Heavy metals enter water systems through leaching.
5. Ingestion of heavy metals can cause brain, liver, and kidney damage, and coma and death.
6. Some organic pollutants include gasoline, oils, plastics, pesticides, fertilizers, solvents, and wood preservatives.
7. Crude oil spills kill thousands of birds, mammals, and other water organisms. They upset the ecosystem for many years.
8. When large amounts of nitrates and phosphates enter lakes and waterways, they allow runaway growth of algae and aquatic plants. As the plants decompose, the amount of oxygen in the water drops and many animal communities die out as a result.

SECTION REVIEW 21.3

1. Radioactive pollutants are produced by nuclear power plants, uranium mines, and nuclear weapons facilities.
2. Radioactive pollutants last for a long time and are dangerous, even in small quantities.
3. Power plants and industrial facilities produce thermal pollution.
4. Cool water from lakes, streams, or bays is pumped into pipes to be used as coolant in industrial and power plants. The cool water from surface water sources is run through pipes that lie alongside pipes containing hot water from the plant. Heat is transferred to the cool water system, making it hot. This hot water is then returned to the surface water source.
5. Warmer water temperatures, due to discharged warm water, cause an increase in the body temper-



ature of fish living near a plant. This causes an increase in the respiration rate of fish, which then require more oxygen. At the same time, increased water temperature decreases the amount of dissolved oxygen in the water. Consequently, fish suffocate because of a lack of oxygen. Increased water temperature also destroys developing fish eggs.

SECTION REVIEW 21.4

1. Laws to control water pollution have either not been strong enough or have not been enforced.
2. Industry often threatened to move to other areas to avoid fines and to get water pollution laws suspended.
3. The Cuyahoga River caught fire and burned for several days.
4. The Clean Water Act provides a vision of water quality standards and a means of measuring improvement for all states. It is not, however, a set of laws for enforcement.
5. Laws on the local, state, and federal level must pass and be enforced to strictly prohibit pollution.

VOCABULARY REVIEW

1. From the Greek *pathos*, "suffering."
2. From the Latin *toxicum*, "poison."
3. From the Greek *therme*, "heat," and akin to the Latin *per*, "through," and akin to the Latin *lutum*, "mud."
4. From the Greek *eutrophos*, "well nourished, nourishing."
5. B
6. A
7. C

CHAPTER 22

SECTION REVIEW 22.1

1. Sand and dust storms, volcanic eruptions, forest fires, ocean spray, and gases produced by decaying organisms are natural sources of air pollution.
2. Air pollution first became a problem during the Industrial Revolution of the 1700s, when the burning of large amounts of coal and wood became a widespread practice.
3. Particulates are tiny solids suspended in the atmosphere.
4. Pieces of ash, dust, and soot from burning organic matter, liquid droplets in smoke or smog, traces of lead, iron, and copper, and pesticides, herbicides, plant pollen, and fertilizer dust present in air are examples of particulates.
5. Because of their size, particulates are easily inhaled and can become trapped in the lungs.
6. Gaseous pollutants include oxides, hydrocarbons such as methane, and CFCs.
7. Home products such as plastics, insulation, and cleaners give off harmful fumes. In addition, air circulation in homes that are energy-efficient is often poor.
8. Common sources of indoor air pollution include cigarette smoke, carpeting, paint thinner, insulation, cleaning agents, solvents, pollen, burning wood and coal, and radon gas.

SECTION REVIEW 22.2

1. Air pollution is believed to cause bronchitis, emphysema, and many forms of cancer in humans. Some pollutants cause headaches, dizziness, eye irritations, and may even trigger asthma or allergy attacks.
2. a. Ozone and the sulphur oxides are the air pollutants most hazardous to plants.
b. Plant stems will be brittle and leaves will be spotted.
3. When plants die, the entire food chain is adversely affected. As with humans, animals suffer the same health problems caused by air pollution. Heavy metals that contaminate rangeland through the groundwater can poison grazing animals.
4. Carbon monoxide binds with the hemoglobin in blood more readily than oxygen does. Once it does bind with hemoglobin, oxygen cannot bind and the amount of oxygen carried through the blood is reduced.

SECTION REVIEW 22.3

1. Precipitation becomes acidic when it reacts with carbon dioxide or the oxides of sulfur and nitrogen in the air.
2. Carbonic acid, sulfuric acid, and nitric acid are some acids that fall to Earth with precipitation.
3. The ozone layer absorbs most of the sun's harmful UV radiation and prevents it from reaching Earth's surface.
4. Sunburn, skin cancers, blindness, crop damage, and destruction of microorganisms at the base of the ocean ecosystem are some effects of UV radiation.
5. Scientists think that for every atom of chlorine or fluorine in the stratosphere, thousands of molecules of ozone are destroyed. This makes Earth's surface increasingly vulnerable to UV radiation.
6. People use CFCs in air conditioners and refrigerators, as propellants in aerosol sprays, and in the process of manufacturing polystyrene and other plastics.
7. The trapping of radiated heat by gases in the atmosphere is called the greenhouse effect.
8. Carbon dioxide, methane, oxides of sulfur and nitrogen, ozone, and CFCs are some greenhouse gases. Most greenhouse gases form as a result of human activities, especially the burning of fossil fuels.
9. Global warming is an increase in Earth's surface temperature, which scientists think is caused by greenhouse-gas pollution.

SECTION REVIEW 22.4

1. Particulates are removed when they stick to the surfaces of rain or snow. Aerosols can dissolve in precipitation. Carbon gases may be removed from the air by plants and protists and by the ocean.
2. Precipitation may eliminate pollutants from the air, but it deposits them into soil and water. The ability of the ocean to hold carbon dioxide may be limited as global warming increases ocean temperatures.
3. The best way to eliminate carbon dioxide emissions from cars is to design cars that do not use gasoline as a fuel source.



4. Some human efforts to control air pollution include designing cars that produce no gaseous pollutants, developing technology to remove pollutants from the exhausts of coal plants and power plants, and enacting legislation to curb air pollution.
5. Cars that use other sources of energy are very expensive. The installation of pollution-control devices in factories could make operating expenses so high that businesses could fail and jobs could be lost. For these reasons, enacting and enforcing air pollution legislation is difficult.

SECTION REVIEW 22.5

1. Noise is considered to be a form of pollution since loud or high-pitched sounds can be harmful to living things.
2. Health problems include stress and hearing damage or loss. Persistent noise may even lead to emotional and psychological problems.
3. Sound intensity is measured by a unit called the decibel.
4. Sound ratings of 70 to 80 dB can lead to hearing loss. Sound ratings louder than 130 dB can cause physical pain and lead to serious hearing damage.
5. Rock concerts, honking cars in traffic jams, and jets at takeoff are some examples of things with high sound ratings. Other answers are possible.
6. Some ways to control noise pollution include wearing ear protectors, limiting the time people are exposed to noise, designing machinery that operates quietly, and enacting and enforcing legislation that requires noise reduction. Other answers are possible.



VOCABULARY REVIEW

1. E 2. L 3. K 4. H 5. C 6. G 7. B 8. J 9. F
10. A 11. D 12. I

UNIT REVIEW 6

1. The formation of 10 cm of new soil may take hundreds or even thousands of years to form.
2. Students may suggest that people garden and farm organically, plant cover crops, and use farm machinery designed for low soil impact, and to conserve minerals so that the need for mining new minerals is lessened. Many other suggestions are possible.
3. Some sources include the disposal of solid wastes such as garbage, refuse, and sludge in landfills, and the dumping of hazardous materials such as battery acid, pesticides, paint thinners, medical wastes, paints, and numerous hazardous household wastes in landfills and other land areas.
4. Strip-cropping, contour farming, terracing, and planting shelter belts (windbreaks) help prevent soil erosion.
5. No. Cleaner methods of technology, methods of affordable, safe disposal, and reducing hazardous wastes are also needed to solve the problem of hazardous waste disposal.
6. There is little evaporation of water at night, so the lawn actually receives more water and water can be conserved.
7. a. Parasites, bacteria, and viruses that cause dis-

- eases in living things.
- b. A large increase in water temperature due to human activity.
8. Heavy metals can enter the groundwater where grasses grow. Grazing animals that eat grass or drink water containing heavy metals are likely to ingest these metals, which accumulate in animals' body tissues and are then, in turn, eaten by people.
9. Wind currents in the atmosphere carry pollutants to all areas of the world. This is what makes acid precipitation a global problem.

CHAPTER 23

SECTION REVIEW 23.1

1. The variety of species in an ecosystem is referred to as an ecosystem's biodiversity.
2. Over time, all ecosystems change. If a species fails to adapt to these changes, it becomes extinct.
3. Mass extinctions are relatively short periods of time in which many species die.
4. Over 99 percent of all species are now extinct.
5. Human activity, such as habitat destruction, pollution, hunting, and the introduction of alien species, is causing the mass extinction.
6. Disturbing the part of an ecosystem an organism needs to survive is called habitat destruction.
7. Land development, swamp draining, altering the course of rivers, mining and quarrying practices, overgrazing, and recreation activities are some causes of habitat destruction.
8. An alien species is a nonnative species introduced to an area by humans, such as the water hyacinth that was brought to Florida from South America.

SECTION REVIEW 23.2

1. Deforestation is the main cause of the loss of biodiversity.
2. Population growth and demand for resources are the main causes of deforestation.
3. About seventy percent of all biodiversity on land is contained in rain forests.
4. People want to use or sell the wood from rainforest trees, and people want pastureland on which grass-fed beef cattle can graze.
5. The soil of the rain forest is nutrient-poor. When vegetation is removed for farming, the soil becomes entirely depleted of nutrients within a few years. Farmers must then clear new land for crops, leaving behind barren tracts of land.
6. More than half of the forests in developed nations have been destroyed by human activities.
7. Rain forests can regenerate if the species that live there do not become extinct. However, estimates for regeneration of rain forests range from hundreds to thousands of years.
8. Water pollution and overfishing in coral reefs and damage to wetlands by pollution and development have caused loss of biodiversity in aquatic habitats.

SECTION REVIEW 23.3

1. Biodiversity provides new genetic material for the improvement of farm plants. Biodiversity also provides a source of natural chemicals used in the development of medicines.
2. Plant geneticists use genetic material from wild

crop ancestors to develop strains of crops that are resistant to diseases and pests, and which may be more suited to certain climatic conditions, such as drought, heat, humidity, and so on.

3. Many medicines come from plants. As the biodiversity of the rain forest is reduced, countless plants and their applications to the development of new medicines may be forever lost.
4. Some groups and organizations are currently collecting and storing the genetic material of crop ancestors.
5. An area where the ecosystem is relatively undisturbed by the activities of humans is called a wilderness.
6. Wilderness areas are havens for some organisms that may no longer exist anywhere else. Wilderness areas also serve as places of recreation for people. Some consider wilderness areas vital to emotional health.
7. The mass extinctions of today involve the disappearance of entire ecosystems, not just individual species. Both species and niches are disappearing.

SECTION REVIEW 23.4

1. Developed nations play an important role in causing deforestation through their demands for beef, wood, and other raw materials. In effect, industrial societies provide a market for rainforest products. In developing nations, increasing populations, food shortages, and poverty play a role in the deforestation of rain forests.
2. The formation of gene banks is one way that species can be preserved even if their habitats are destroyed.
3. The law requires the U.S. government to make a list of all species in the United States that are in danger of extinction. It also protects the habitats of those species.
4. The law protects only those species listed. Getting a species listed is difficult. The law allows development in an area provided a new habitat is created for the protected species. The inherent flaw is that entire habitats cannot be replaced because they are too complex. Many people feel that laws should protect the diversity of entire habitats, not just an individual species within a habitat.

VOCABULARY REVIEW

Accept all logical answers.

CHAPTER 24

SECTION REVIEW 24.1

1. Conservation involves decreasing demand for resources and using resources more efficiently so that little is wasted.
2. Demand for gasoline could be reduced if people relied more on mass transit and carpooling. Accept all logical responses.
3. By lowering the demand for a resource, less of it is taken from the environment, which could mean less habitat destruction and less pollution.
4. Waste can be reduced by recycling products and by using less packaging in products. Accept all logical responses.

5. Fluorescent bulbs produce more light while using less energy, and they last considerably longer than incandescent bulbs.
6. Energy-rating numbers allow the consumer to compare the energy efficiency of one appliance with another. Buying the appliance with greater energy efficiency will save the consumer money in the long run and will also conserve energy.
7. By car pooling, gasoline is conserved and there is less air pollution.

SECTION REVIEW 24.2

1. It costs less to reuse materials than to extract raw materials.
2. Recycling reduces the amount of garbage that is thrown away, meaning less is dumped into the environment. It is also less polluting because it requires less burning of fossil fuels than does taking new resources from the environment.
3. Paper is the easiest material to recycle. Recycled paper is used in newsprint, cardboard boxes, books, and in packaging.
4. Recycling aluminum is 95 percent less polluting than producing it from ore.
5. Recycling motor oil keeps toxic substances from polluting land and water. In addition, two-thirds less energy is used to clean oil than to refine it.
6. Plastics are made of complex organic molecules that do not break down easily. In addition, many give off toxic fumes if incinerated. Another problem is that different types of plastics may not be recycled together.
7. Recycling plastic is especially important because most plastics do not break down in the environment.
8. Bath tubs, containers, insulation, and building materials are some products made from recovered plastics.

SECTION REVIEW 24.3

1. Until recently, conservation efforts focused on saving individual endangered species.
2. The ten condors that remained were captured and bred in captivity.
3. Captive breeding programs of individual species are complicated and costly. Also, putting a species back into the wild may not be possible if its natural habitat is destroyed.
4. Today, ecologists feel conservation efforts should focus on preserving entire ecosystems to ensure the protection of natural habitats and species interaction.
5. A preserve is an area of land or water set aside for the protection of that ecosystem.
6. The expansion of preserves will conflict with the interests of people.

VOCABULARY REVIEW

1. B 2. E 3. A 4. D 5. C 6. F



CHAPTER 25

SECTION REVIEW 25.1

- Supply is the availability of a resource to be purchased.
 - Demand is the amount of a resource that people desire and are willing to purchase.
- Generally, the price of a resource increases as the demand for that resource increases. The price of a resource will also increase if the supply of a resource decreases.
- Religion, culture, society, and economics are some influences that control how people value things.
- The demand for basic resources is increasing while supplies are decreasing.
- A policy is an outline of actions, incentives, penalties, and rules that a company, group, or government follows concerning a particular issue.
- Determining what is an acceptable amount of risk is called risk assessment.
- Some problems include insufficient funds for research, subjectivity of the researcher, and limitations of real-life cause-and-effect models for new products and new technology.
- It is an analysis of social costs versus social benefits.
- The goal is to increase benefits while at the same time reduce costs.



SECTION REVIEW 25.2

- Many answers are possible. Some answers include local codes concerning septic installation, recycling efforts, bottle laws, sound barriers along highways, hunting laws, laws that regulate the disposal of wastes, requiring local building developers to submit environmental impact statements, and so on.
- The shift is largely due to states' preference to handle their own problems.
- Citizens must be informed about the issues, they must be motivated and concerned, and they must take action.
- People pay a deposit on each bottle or can of a beverage that they buy. They can get their money back only if they return the empty cans and bottles to the store, as opposed to throwing them away.
- Environmental impact studies predict how proposed projects might affect the environment.

SECTION REVIEW 25.3

- The federal government must consider the impact of the policy on all of the states in the nation. Some policies may benefit one region of a nation but harm others.
- Intervention by the federal government takes place when the actions of one state affect the quality of life in another state.
- Federal laws are needed because pollutants enter the river at various sources and are carried downstream into other states.
- Many responses are possible, and may include the example of air pollutants being blown by wind from one state to another, or the drainage of wetlands in one state affecting the supply of water to another state. Also, the building of a dam might affect the flow of water far away.
- Restrictions on fishing certain populations of fish are

currently in place because some fishes are endangered. Native Americans, by treaty, have fishing rights that may not be altered. These rights have been challenged in court and have been upheld so far. This set of events has been a source of continuing conflict between sport-fishing and commercial fishing representatives and Native Americans who fish these areas.

SECTION REVIEW 25.4

- Developing nations argue that developed nations have no right to caution developing nations about conserving resources when the developed nations have sold or depleted their own resources to become wealthy. Developing nations also feel that developed nations dominate policy-making to further their own interests.
- Biodiversity, global warming, sustainable development, and relations between developing and developed nations regarding environmental matters were discussed.
- Students should state in their own words resolutions outlined in table 25.1.
- Students should describe how a high school student began a writing campaign to stop the capturing and killing of dolphins in tuna nets. This campaign eventually led to a change in fishing practices in the tuna industry.
- Many responses are possible. Students might mention the problem of excess packaging on products and suggest that consumers write to companies and demand that unnecessary packaging be omitted or that only recycled materials be used for packaging.
- Advocacy groups monitor environmental practices or policies. They exert pressure on politicians to investigate problems, and may offer remedies and incentives.

VOCABULARY REVIEW

1. C 2. F 3. D 4. A 5. B 6. E

UNIT REVIEW 7

- Many examples are possible. Some examples include the African and Indian elephant, rhino, and tiger, the Florida panther, the California condor, the purple coneflower, and the pitcher plant.
- For most species, habitat destruction by humans is the reason for impending extinctions. Pollution and other reasons are also possible.
- Entire ecosystems are being lost rather than just individual species. This reduces species and niches, thus limiting diversity.
- Conservation of resources, recycling resources, and preserving biodiversity are the three basic concepts people must accept in order to build a sustainable society.
- In the past, conservationists focused on preserving individual species. Today, they concentrate on the need to preserve entire ecosystems in order to protect natural habitats and the many species that interact with endangered species.
- Accept all responses that show an understanding of conservation, such as reusing plastic and paper bags, turning down the thermostat, turning off lights, carpooling, and so on.

7. Writing letters expressing personal views to people who decide policy, voting, boycotting, protesting, and supporting environmental groups that are politically influential are some ways that individuals can influence policy-making decisions.
8. Many answers are possible, but students may suggest that the interests of countries are varied and sometimes conflicting, the problems are too complex to solve, and that enforcing such policies would be extremely difficult on such a large scale.

