

Unit 2: Ecology



Big Idea...

The natural world is defined by organisms and life processes which conform to principles regarding conservation and transformation of matter and energy. Knowledge about life processes can be applied to improving human health and well being.

Questions...

- How is **matter** transformed in living systems?
- How is **energy** transferred and transformed in living systems?
- How can **change** in one part of an ecosystem affect other parts of the ecosystem?
- How do **humans** impact the diversity and stability of ecosystems?

Topics...

- Ecology is the study of interactions among living and nonliving things in an ecosystem.
- There are various types of interactions and scientists study them in many ways.
- The Earth is divided into biomes.
- Humans impact ecosystems within these biomes.

Chapters...

- Chapter 13: Principles of Ecology (p.370)
- Chapter 14: Interactions in Ecosystems (p.400)
- Chapter 15: The Biosphere (p.426)
- Chapter 16: Human Impact on Ecosystems (p.452)

Standards

5.3/12 A3,B1,B3,B6,C1,C2,C3; **RST/9-10** 1,4,5,10; **CTE9.1/11** A3,F6; **CTE9.4/12** 1,7,52; **12/N-Q** 1; **12/A-REI** 10; **12/S-ID** 1-7; **12/S-IC** 1-6 (Source: [BHPS Biology Curriculum Guide](#))

Date	Do Now

Chapter 13: Principles of Ecology



Vocabulary

ecology	keystone species	herbivore	trophic level
community	producer	carnivore	food web
ecosystem	autotroph	omnivore	hydrologic cycle
biome	consumer	detritivore	biogeochemical cycle
biotic	heterotroph	decomposer	nitrogen fixation
abiotic	chemosynthesis	specialist	biomass
biodiversity	food chain	generalist	energy pyramid

Key Points...

- Ecology is the study of relationships among organisms and their environment.
- Every ecosystem contains both living and nonliving factors.
- Life in an ecosystem requires a source of energy.
- Food chains and food webs model the flow of energy in an ecosystem.
- Matter cycles in and out of an ecosystem.
- Pyramids model the distribution of energy and matter in an ecosystem.

What you should know and be able to do...

1. Define ecology.
2. Differentiate between abiotic and biotic factors.
3. Sequence the levels of biological organization.
4. Trace the flow of energy through living systems, identifying energy roles in ecosystems and feeding relationships.
5. Evaluate the efficiency of energy transfer among organisms through the various trophic levels and ecological pyramids.
6. Describe how abiotic and biotic factors work together in an ecosystem.
7. Interpret food chains, food webs, and pyramid models.
8. Describe how nutrients move through the biotic and abiotic parts of an ecosystem.
9. Compare and model biogeochemical cycles (water, carbon, nitrogen, phosphorus).

Chapter 13 Questions

13.1

13.2

13.3

13.4

13.5

13.6

Chapter 13: What do you already know?

Choose the letter of the best answer.

- _____ 1. All living things are made up of
- a. organs.
 - b. enzymes.
 - c. cells.
 - d. oxygen.
- _____ 2. Figure 13.1 illustrates how plants undergo photosynthesis. What waste product from this reaction is crucial for humans?

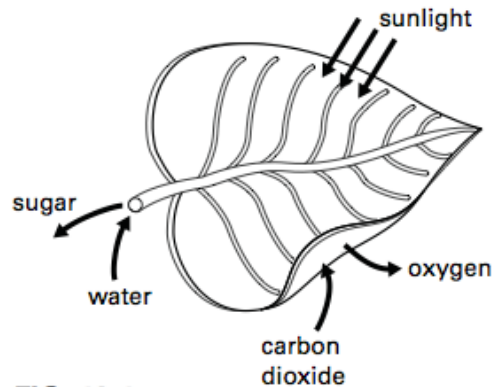


FIG. 13.1

- a. sugar
 - b. CO₂
 - c. water
 - d. O₂
- _____ 3. During cellular respiration, plants and animals break down sugar to obtain
- a. water.
 - b. oxygen.
 - c. energy.
 - d. carbon dioxide.
- _____ 4. To test the hypothesis that wolves eat mice, a scientist would have to
- a. conduct an experiment.
 - b. formulate a theory.
 - c. create a model.
 - d. evaluate results.
- _____ 5. Which statement best describes the importance of photosynthesis?
- a. Photosynthesis keeps plants green.
 - b. Photosynthesis makes water available to the plant.
 - c. Photosynthesis provides the plant with sugar.
 - d. Photosynthesis builds plant DNA.

- _____ **6.** Which of the following terms best describes all of the rainbow trout that live in one particular river?
- a.** population.
 - b.** community
 - c.** system
 - d.** biome

- _____ **7.** The two finches in Figure 13.2 have two different shapes of beaks. One has a large beak and eats nuts and seeds. The other finch has a long beak that it uses to pick insects off tree bark. Which of the following statements is true?

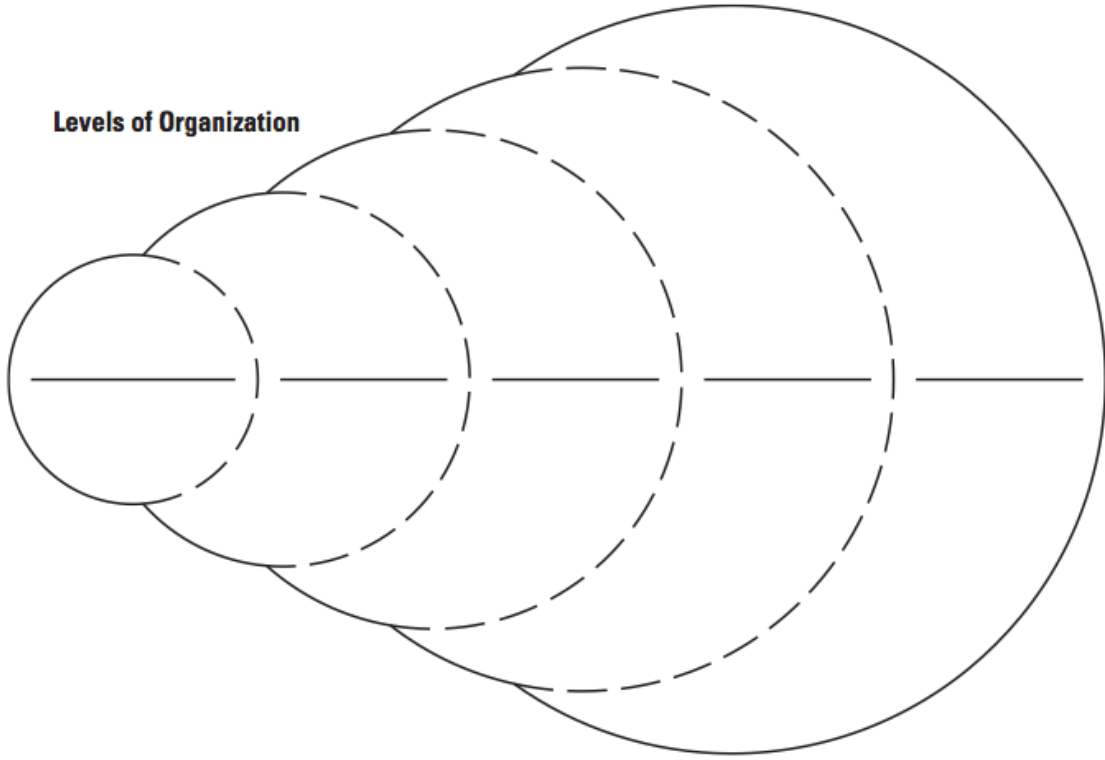


FIG. 13.2

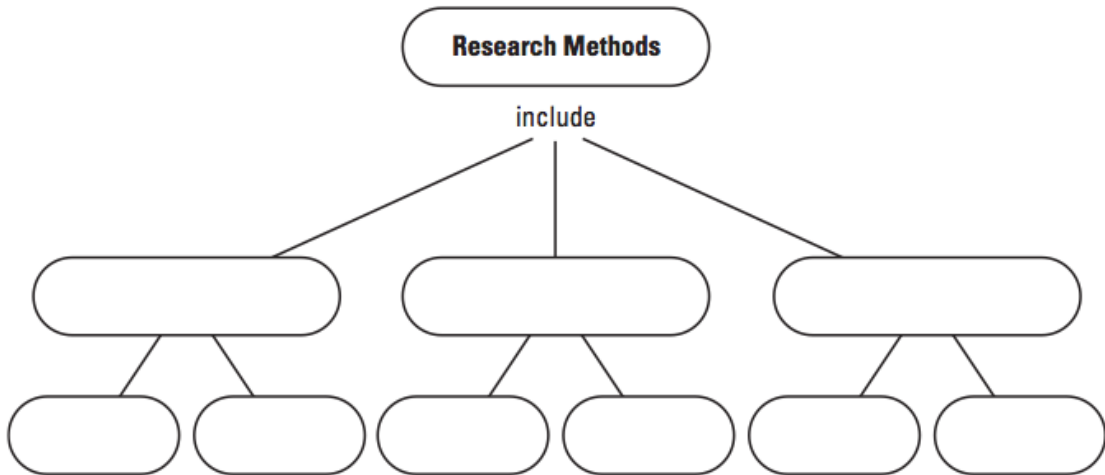
- a.** The two finches belong to the same species.
 - b.** The two finches are not the same size.
 - c.** The two finches have traits that allow them to eat different food.
 - d.** The two finches probably do not exist today.
- _____ **8.** The basis of most molecules that make up living things is
- a.** nitrogen.
 - b.** hydrogen.
 - c.** oxygen.
 - d.** carbon.
- _____ **9.** Which of the following can be lost or used up during a chemical reaction?
- a.** electrons
 - b.** enzymes
 - c.** matter
 - d.** energy
- _____ **10.** The unique properties that make water so important to life on Earth are related to water's
- a.** complex molecular structure.
 - b.** inability to dissolve substances.
 - c.** hydrogen bonds.
 - d.** stable electrons.

SECTION
13.1 | ECOLOGISTS STUDY RELATIONSHIPS
Power Notes

Levels of Organization

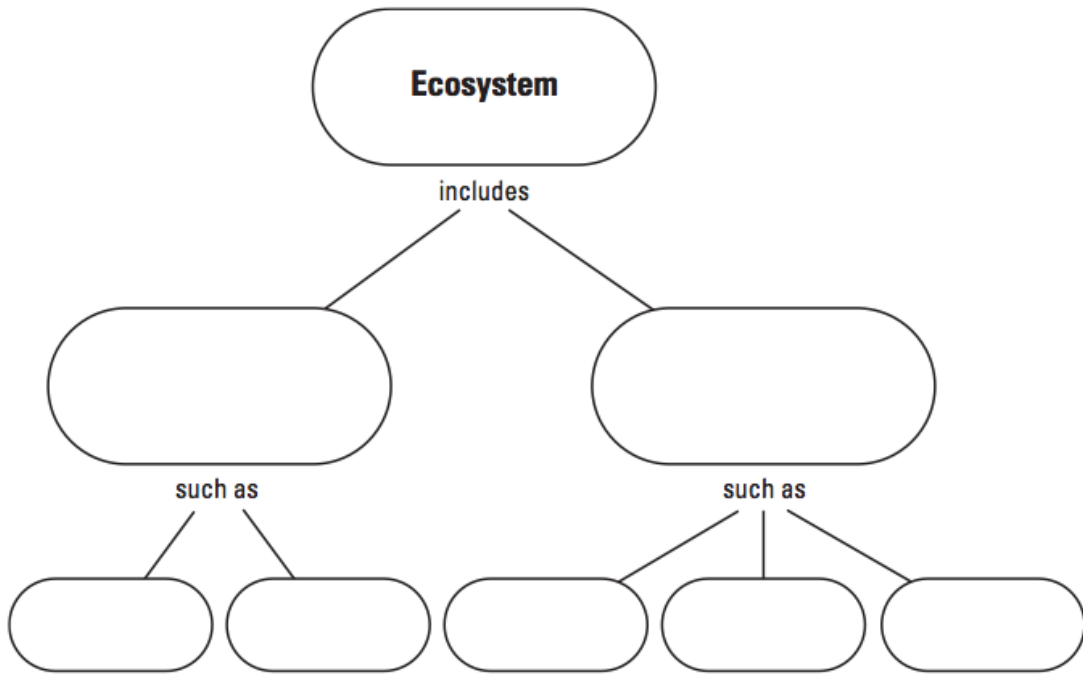


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SECTION
13.2

BIOTIC AND ABIOTIC FACTORS
Power Notes



Complex Relationships Within an Ecosystem

Biodiversity is...

A keystone species is...

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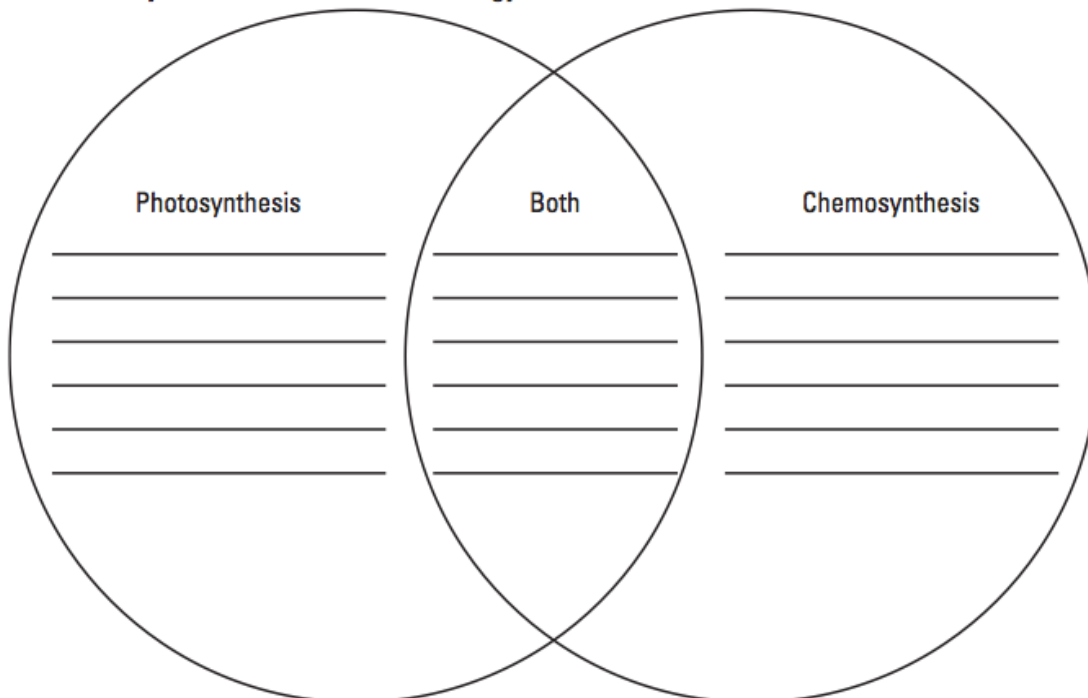
SECTION
13.3 | ENERGY IN ECOSYSTEMS
Power Notes

Producers and Consumers

Type	Also Called	Description

Processes by Which Producers Obtain Energy

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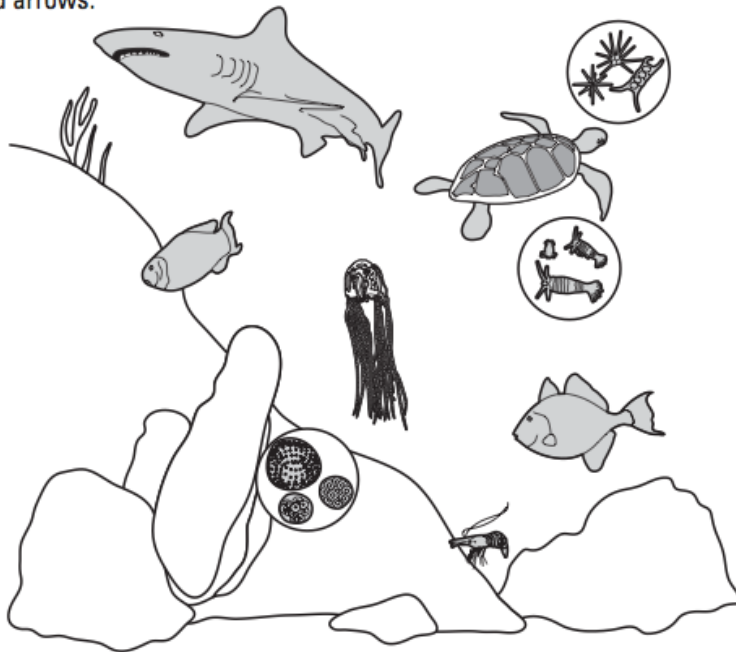
SECTION
13.4 | FOOD CHAINS AND FOOD WEBS
Power Notes

Types of consumers:

- 1.
- 2.
- 3.
- 4.

A food web shows:

Add arrows:



Trophic Level
Producer

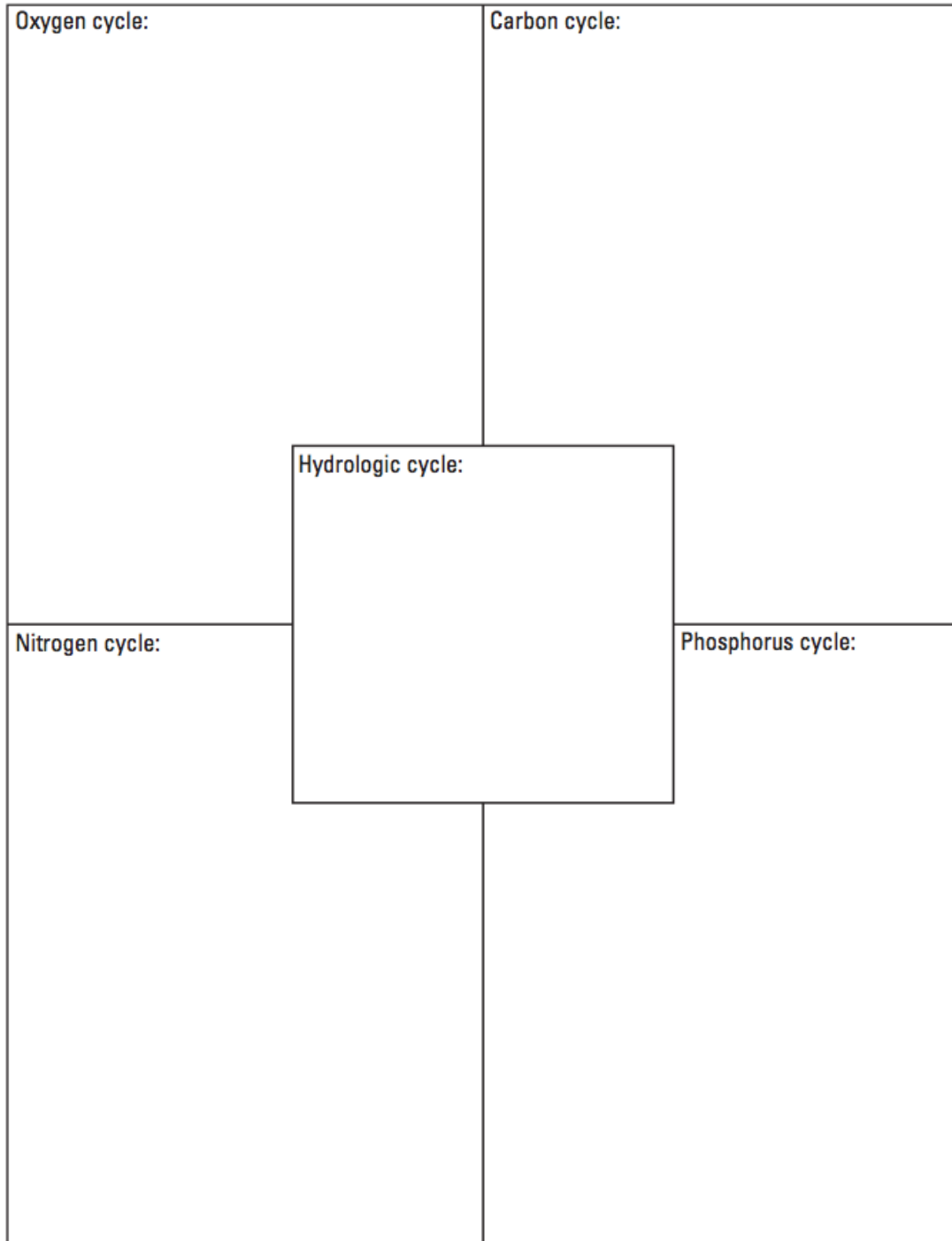
Primary consumers

Secondary consumers

Tertiary Consumer

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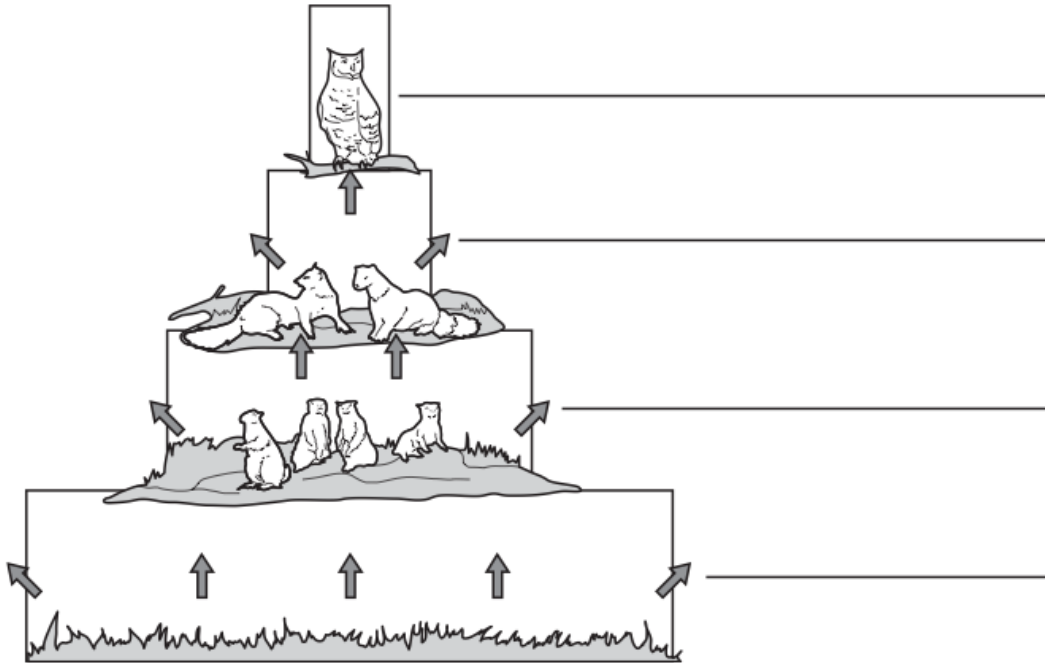
SECTION
13.5 | CYCLING OF MATTER
Power Notes



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SECTION 13.6 | PYRAMID MODELS
Power Notes

Trophic Levels



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Energy pyramid:

Two other pyramid models:

1. _____
 Measures:

2. _____
 Measures:

ecology	keystone species	herbivore	trophic level
community	producer	carnivore	food web
ecosystem	autotroph	omnivore	hydrologic cycle
biome	consumer	detrivore	biogeochemical cycle
biotic	heterotroph	decomposer	nitrogen fixation
abiotic	chemosynthesis	specialist	biomass
biodiversity	food chain	generalist	energy pyramid

A. Synonyms or Antonyms Identify the words in each pair as synonyms, which are words that mean roughly the same thing, or antonyms, which are words that mean roughly the opposite.

- _____ 1. producer/autotroph
- _____ 2. specialist/generalist
- _____ 3. biotic/abiotic
- _____ 4. consumer/heterotroph
- _____ 5. chemosynthesis/photosynthesis
- _____ 6. herbivore/meat-eater

B. Stepped-Out Vocabulary Define each word. Then write two additional facts that are related to the word.

WORD	DEFINITION	MORE INFORMATION
Example herbivore	<i>an organism that eats plants</i>	primary consumer a cow is an herbivore
1. keystone species		
2. omnivore		
3. decomposer		

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C. Word Origins Circle the Greek and Latin word parts in each vocabulary term. Then use the Greek and Latin meanings to construct a very basic definition of the vocabulary word.

bio- = life	auto- = self	carnus = flesh
eco- = home	hetero- = different	omnis = all
syn- = together	chemo- = chemical	detere = to wear away
-vore = eat	photo- = light	geo- = earth
-troph = nourishment	-logy = study of	
hydro- = water	herba = vegetation	

WORD	DEFINITION
1. ecology	
2. photosynthesis	
3. carnivore	
4. herbivore	
5. detritivore	
6. omnivore	
7. chemosynthesis	
8. autotroph	
9. heterotroph	
10. biogeochemical cycle	
11. hydrologic cycle	
12. biomass	

D. Categorize Words Write "A" next to words that can describe abiotic factors. Write "B" next to words that can describe biotic factors.

- | | | |
|--------------------|-----------------|-----------|
| 1. ___ wind | ___ sunlight | ___ deer |
| 2. ___ soil | ___ sunflower | ___ water |
| 3. ___ fungus | ___ snow | ___ eagle |
| 4. ___ temperature | ___ prairie dog | ___ frog |

E. Find the Odd Word Place a check mark next to the word that does not belong and explain why.

1. consumer Explanation _____
 carnivore _____
 plant
2. detritivore Explanation _____
 producer _____
 decomposer
3. omnivore Explanation _____
 autotroph _____
 herbivore
4. trophic level Explanation _____
 energy pyramid _____
 keystone species

F. What's the Difference? For each pair of words below, describe the difference between the two terms.

1. producer/consumer

2. chemosynthesis/photosynthesis

3. food chain/food web

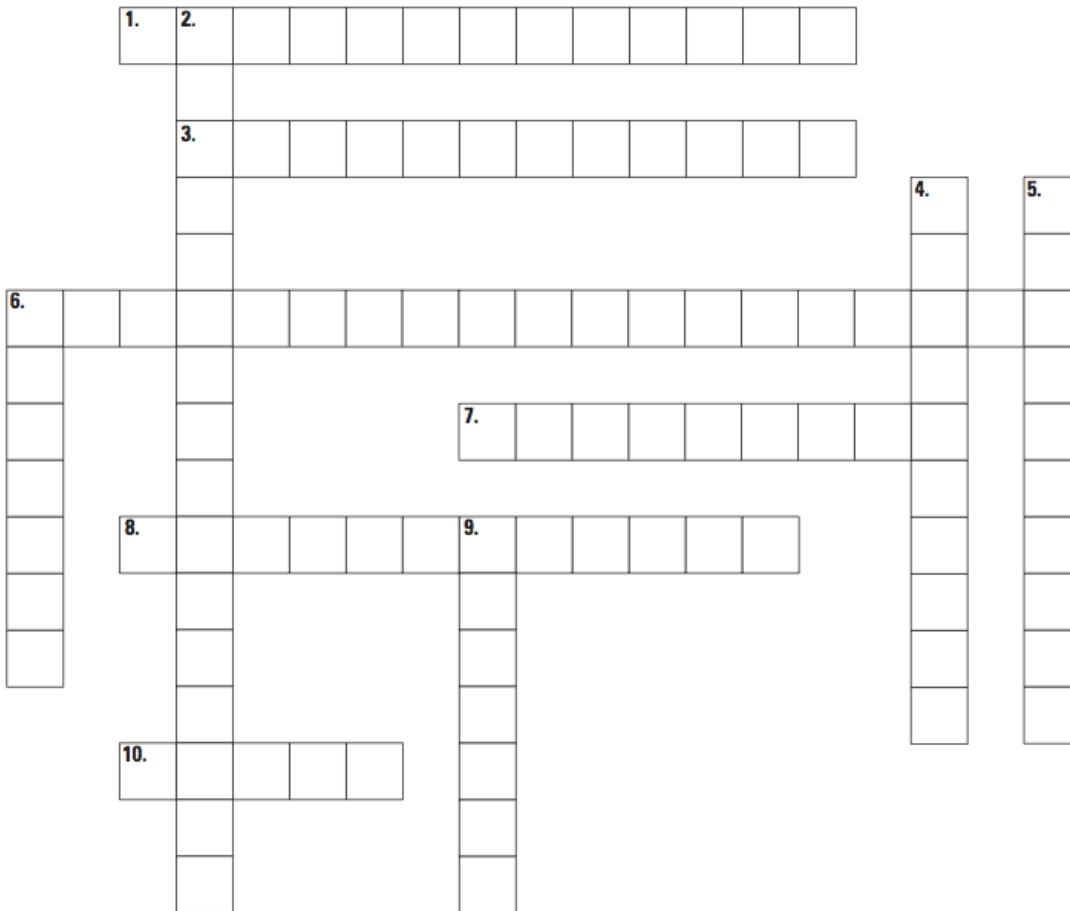
G. Crossword Puzzle Use the clues to solve the puzzle.

Across

1. A diagram that compares energy use among trophic levels
3. Level of nourishment in a food chain
6. Movement of a particular chemical through the living and nonliving parts of an ecosystem
7. All of the organisms as well as the abiotic factors in a given area
8. The variety of living things in an ecosystem
10. A major regional or global community of organisms

Down

2. The process by which gaseous nitrogen is converted into ammonia
4. Detritivore that breaks down organic matter into simpler compounds
5. A consumer that primarily eats one specific organism
6. The measure of the total dry mass of organisms in a given area
7. The study of the interactions among living things, and between living things and their surroundings



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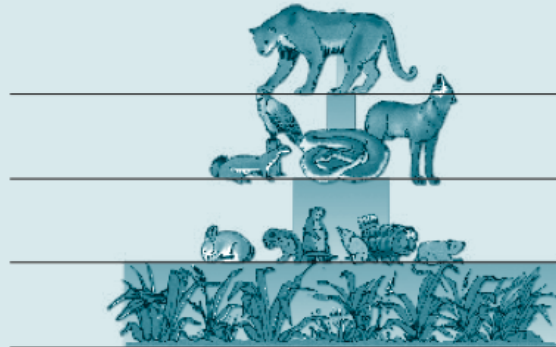
Chapter 13 Review

1. What do ecologists study? _____

2. Label the energy pyramid with the following terms: *tertiary consumers*, *producers*, *secondary consumers*, *primary consumers*.

3. On the energy pyramid, draw an arrow pointing to the trophic level that has the most available energy.

4. The source of energy for most autotrophs is
a. chemicals.
b. oxygen.
c. carbon dioxide.
d. sunlight.



5. Explain why the following statement is true: *The stability of an ecosystem depends on producers.* _____

6. What is biodiversity?
a. total number of organisms in an area
b. total variety of organisms in an area
c. abiotic factors in an ecosystem
d. one species whose presence affects many other species

7. Use the following terms to label the drawings below: *herbivore*, *producer*, *carnivore*.



8. How do elements such as carbon and nitrogen get moved through the living world? _____

Unit Project

Suppose a national environmental magazine has offered a \$1000 scholarship for a winning article on biodiversity, conservation, and environmental stewardship. The article, which will be published in their magazine, is to report on the value of biodiversity and the ecology of an endangered species in the writer's state. The article should include a conservation or recovery plan for the endangered species. You have decided to enter the competition by creating a magazine article, complete with pictures, that describes an endangered species in your state, its population status and distribution, and its habitat and niche. You will include the threats that endanger the species, a conservation or recovery plan, and how the survival of this species is beneficial to people. The endangered species you choose is not limited to animals.

- Use Internet, textbook, and/or library resources to select an interesting endangered species in your state. You must have at least three cited sources included at the end of your article. Go to **HMDScience.com** for helpful resources and links.
- Research the ecology of the species you have selected, such as its description and taxonomy, where and how it lives, and how it interacts with other species in its biological community. Also learn why it is listed as endangered and what threatens its survival.
- Read about current recovery plans for the species. Does the plan take into account all of the threats to which the species is exposed? Decide what you might do to improve the plan and how you would implement any changes to the plan. If the plan is a good one, then decide what you or your community can do to help carry out the plan. For example, if the species is being affected by water pollution, could your community help by campaigning for cleaner water? Describe and justify at least two ways you could improve or support the recovery plan and how you or your community could best carry out the measures.
- Explain how the survival of this species is beneficial to people.
- Organize your findings. Outline and fill in your notes as follows:

Title

Introduction

Description and taxonomy

Population status and distribution

Ecology, habitat, niche

Threats to survival

Conservation or recovery strategies

Goals

Benefits

Importance to people

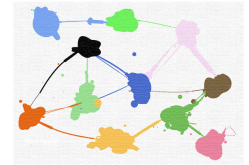
- Write or type your magazine article on 8.5" x 11" unlined paper. Your article should be a minimum of four pages in length. Illustrate your article, and create an attractive title or cover page that includes your name as the writer. On the last page, list your sources of information. Bind your pages together magazine style.
- Be as creative as possible, and be sure to make your magazine article neat, organized, and easy to follow.

A Scholarship for Stewardship Evaluation Rubric

Requirements	Maximum Points	Earned Points (teacher to fill in)
Endangered species is described fully, including its description, taxonomy, population status, distribution, ecology, habitat, and niche.	10	
Threats to the survival of the species are thoroughly explained, including the reason it is listed as endangered.	10	
Description of the existing recovery plan for the species is included.	15	
At least two ways you could improve or support the existing recovery plan and how you or your community could best carry out the measures are described in detail and a rationale is provided as to how this improvement or support is helpful to the species. (Two ways to improve, two ways to support, or one of each is expected.)	15	
Explanation of how the survival of this species is beneficial to people is thorough.	15	
Headings in the given outline have been incorporated into the article, and addressed.	10	
Article is illustrated and has an attractive cover that includes the magazine title, the article title, and the author's name.	10	
Magazine is bound neatly in magazine style.	5	
Article is neat, organized, and easy to follow.	5	
At least 3 cited sources are included at the end of the article.	5	
Rubric Score:	100 points	
Extra Credit (given at teacher's discretion):		
Powerpoint slideshow about the species is created and presented to the class.		
Total Score:		
Teacher's Comments:		

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Chapter 14: Interactions in Ecosystems



Vocabulary

habitat	parasitism	population crash
ecological niche	population density	limiting factor
competitive exclusion	population dispersion	density-dependent limiting factor
ecological equivalent	survivorship curve	density-independent limiting factor
competition	immigration	succession
predation	emigration	primary succession
symbiosis	exponential growth	pioneer species
mutualism	logistic growth	secondary succession
commensalism	carrying capacity	

Key Points...

- Every organism has a habitat and a niche.
- Organisms interact as individuals and as populations.
- Each population has a density, a dispersion, and a reproductive strategy.
- Populations grow in predictable patterns.
- Ecological succession is a process of change in the species that make up a community.

What you should know and be able to do...

1. Differentiate between an organism's habitat and niche.
2. Identify community interactions: niche, competition, predation, symbiosis.
3. List, describe, and provide examples of three different kinds of symbiosis.
4. Describe characteristics of populations.
5. Explain and apply the concepts of carrying capacity and limiting factors.
6. Model ecological succession in a biome.
7. Identify factors that affect population size.
8. Infer how limiting factors can affect a population's growth rate.
9. Draw and interpret population curves.
10. Analyze why population growth rates differ throughout the world.
11. Predict the consequences of unchecked population growth.

Chapter 14 Questions

14.1

14.2

14.3

14.4

14.5

- _____ **7.** A group of emperor penguins living together on a particular beach is an example of a(n)
- a.** ecosystem. **c.** species.
b. community. **d.** population.
- _____ **8.** Which trophic level provides food for all other levels of a food chain?
- a.** producer **c.** secondary consumer
b. primary consumer **d.** tertiary consumer
- _____ **9.** Which of the following factors leads to greater genetic diversity?
- a.** colder climate **c.** common ancestors
b. sexual reproduction **d.** genetic drift
- _____ **10.** Which of the following best describes the frequency of extreme phenotypes shown in Figure 14.2?

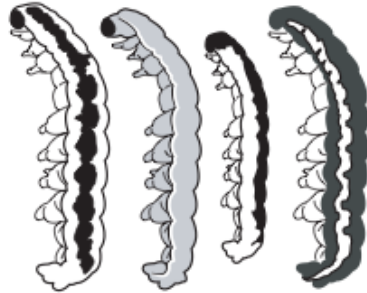


FIG. 12.2

- a.** favored **c.** eliminated
b. more frequent **d.** less common

SECTION
14.1

HABITAT AND NICHE
Power Notes

Habitat:

Ecological niche:

Competitive exclusion is a principle that states:

Two other results of competitive exclusion:

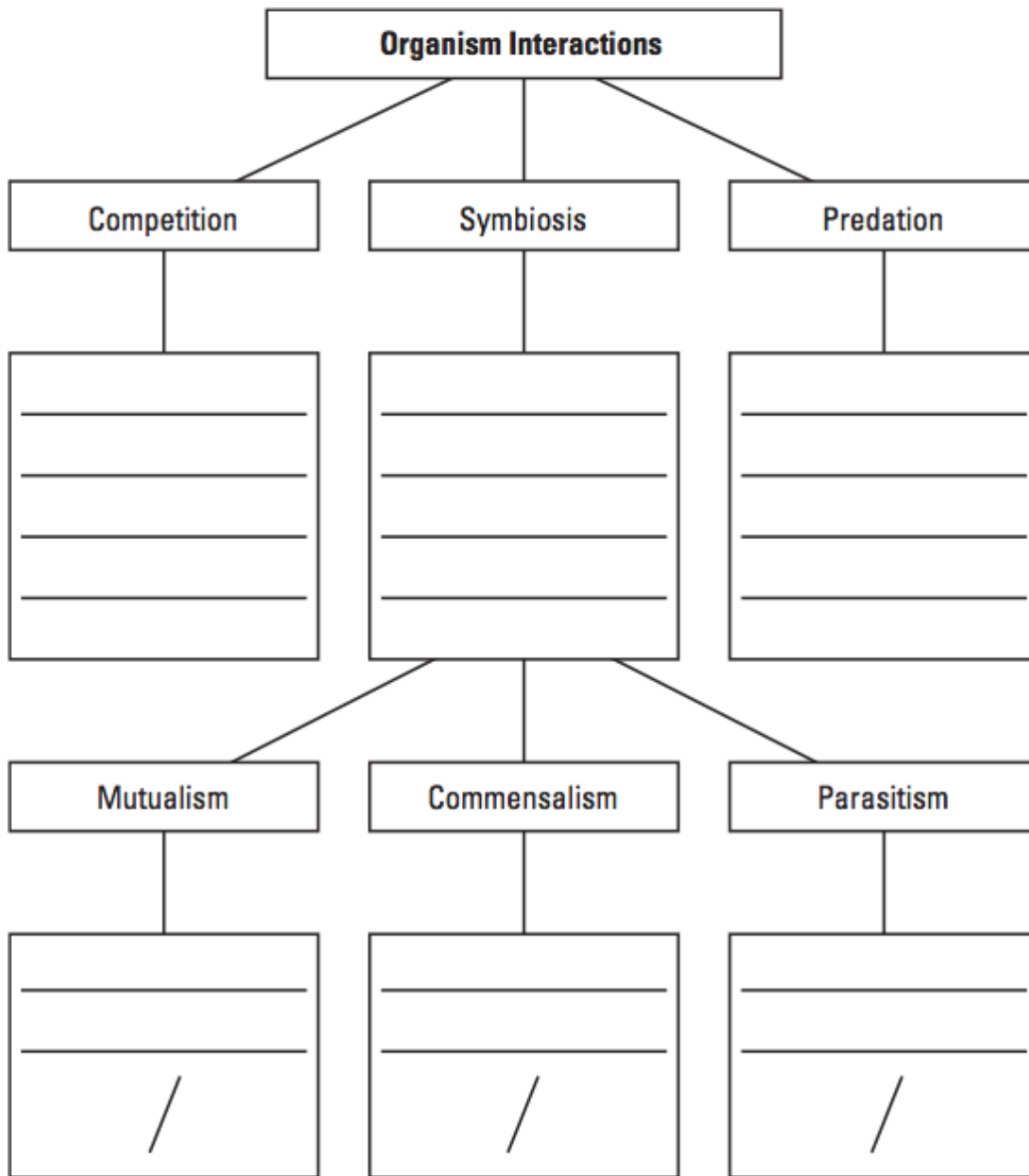
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An ecological equivalent is:

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SECTION
14.2

COMMUNITY INTERACTIONS
Power Notes



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SECTION
14.3

POPULATION DENSITY AND DISTRIBUTION

Power Notes

Population density is:

Calculated Using the Formula:

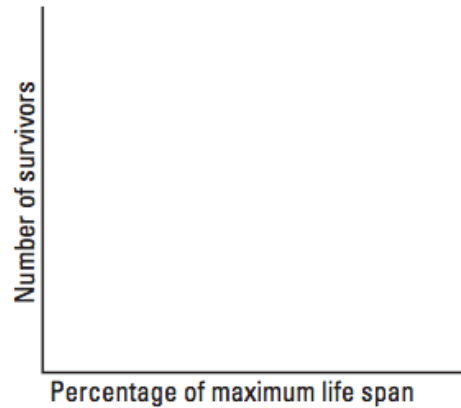
_____ =

Population dispersion is:

Three dispersion types:

_____ _____ _____

A survivorship curve is:



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Three Types of Survivorship Curves

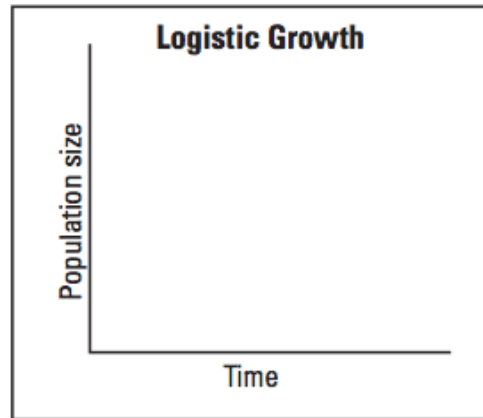
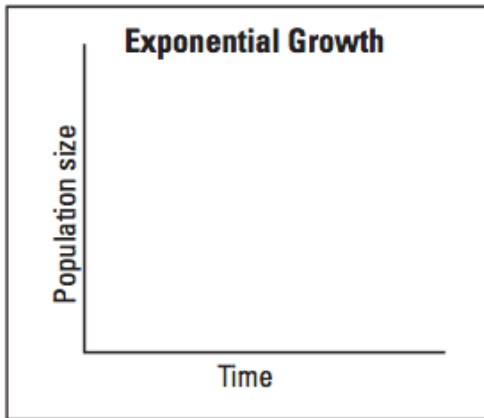
Type	Description
Type I	• •
Type II	• •
Type III	• •

SECTION
14.4

POPULATION GROWTH PATTERNS
Power Notes

Four factors that affect the size of a population:

- _____
- _____
- _____
- _____



Density-dependent limiting factors:

- _____
- _____
- _____

Density-independent limiting factors:

- _____
- _____
- _____

SECTION
14.5

ECOLOGICAL SUCCESSION
Power Notes

Primary succession is: _____

_____	_____	_____	_____

Secondary succession is: _____

_____	_____	_____	_____

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habitat	parasitism	population crash
ecological niche	population density	limiting factor
competitive exclusion	population dispersion	density-dependent limiting factor
ecological equivalent	survivorship curve	density-independent limiting factor
competition	immigration	succession
predation	emigration	primary succession
symbiosis	exponential growth	pioneer species
mutualism	logistic growth	secondary succession
commensalism	carrying capacity	

A. What's the Difference? For each pair of words below, describe the difference between the two terms.

1. primary succession/secondary succession

2. ecological niche/habitat

3. logistic growth/exponential growth

4. density-dependent limiting factor/density-independent limiting factor

5. mutualism/parasitism

B. Matching Write the vocabulary term next to its definition.

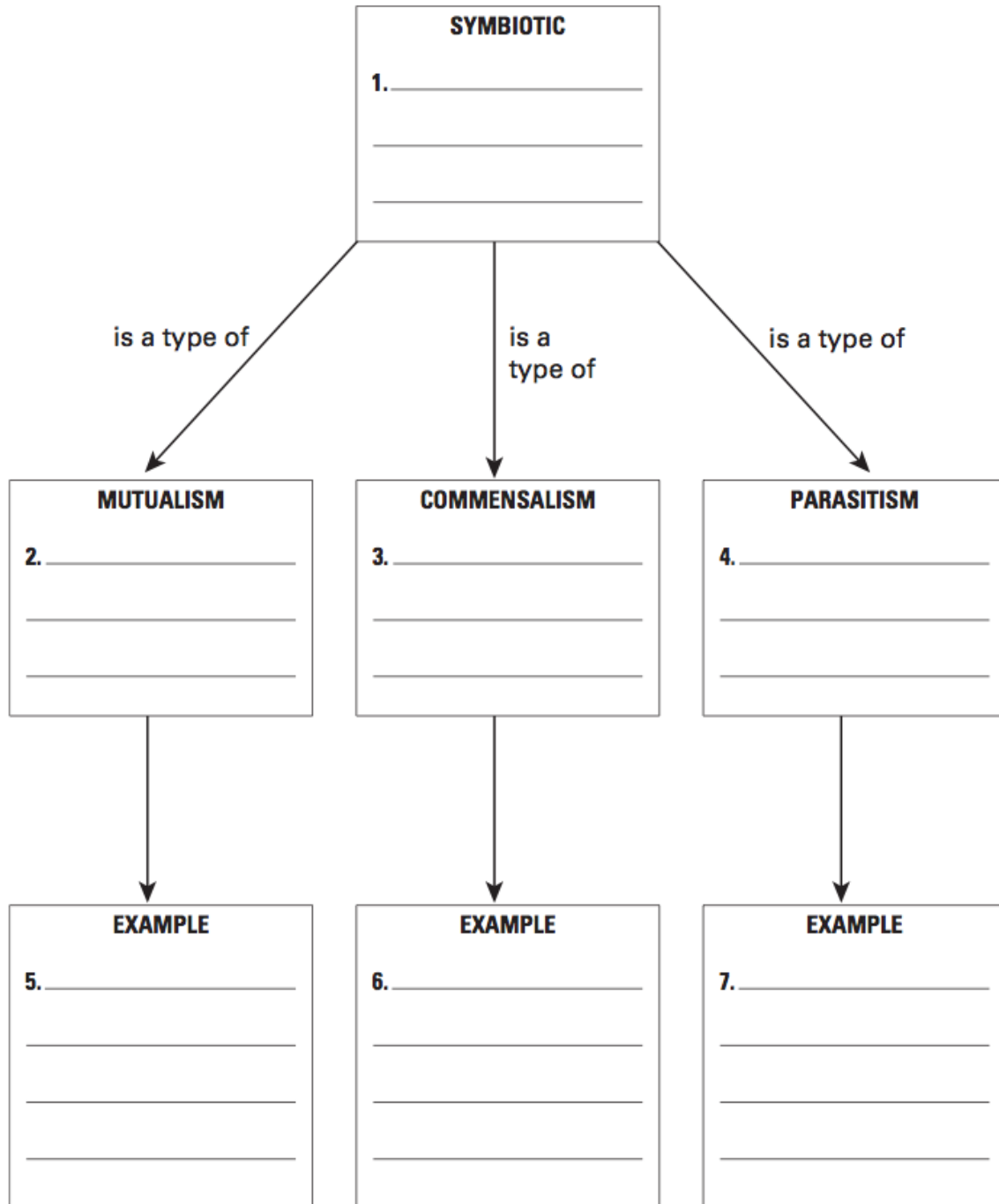
commensalism	mutualism	predation
competition	parasitism	symbiosis

- _____ 1. A close relationship between two or more individuals of different species that live in close contact with one another
- _____ 2. Type of symbiosis in which one individual benefits while the other individual is harmed
- _____ 3. Occurs when one organism captures and eats another organism
- _____ 4. Type of symbiosis in which both individuals benefit
- _____ 5. Occurs when two organisms fight for the same limited organisms
- _____ 6. Type of symbiosis in which one individual benefits while the other individual neither benefits nor is harmed

carrying capacity	immigration	population crash
emigration	limiting factor	

- _____ 7. The movement of individuals *out* of a population into another population
- _____ 8. The maximum number of individuals of a certain species that an environment can normally support over a long period of time
- _____ 9. The movement of individuals *into* a population from another population
- _____ 10. A dramatic decline in the size of a population over a short period of time
- _____ 11. A factor that controls the size of a population

C. Vector Vocabulary Define the words in the boxes. On each arrow, write a phrase that describes how the words in the boxes are related to each other.



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D. Secret Message Fill in the blanks with the vocabulary word that best fits. When complete, write the boxed letters in order in the blanks at the bottom of the page.

1. All of the abiotic and biotic factors in the area where a species lives

___ ___

2. A factor that has the greatest effect in keeping down the size of a population

3. The process by which one organism captures and feeds upon another organism

___ ___

4. A type of species that is the first to live in a previously uninhabited area

___ ___

5. A type of population growth in which a period of slow growth is followed by a short period of exponential growth before leveling off at a stable size

6. Occurs when two individuals compete for the same resources

___ ___

7. A close relationship between two or more different species that live in close contact with one another

___ ___

8. A symbiotic relationship in which one organism is helped and the other is hurt

9. The movement of individuals into a population from a different population

___ ___

10. A symbiotic relationship in which both organisms benefit

___ ___

11. A type of succession in which an ecosystem damaged by fire is reestablished

___ ___

Fill in the blanks with the boxed letters from above to name the famous ecologist:

Chapter 14 Review

1. One way organisms interact is through competition. What do organisms compete for? _____

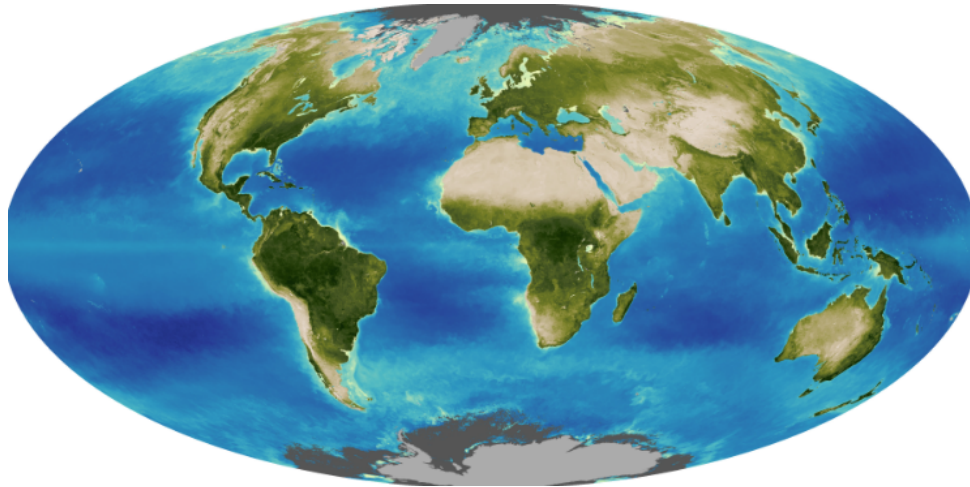
2. Limiting factors limit the growth of a population. A natural disaster, such as a hurricane, is a density-independent limiting factor. What makes this limiting factor density-independent?

3. A lesser long-nosed bat has a symbiotic relationship with the saguaro cactus. Bats help to pollinate the cacti through the indirect transfer of pollen as the bats fly from one cactus to another to feed on cactus flower nectar. What type of symbiosis is this?
 - a. mutualism
 - b. commensalism
 - c. parasitism
 - d. predation
4. What conditions allow for exponential growth of a population? _____

5. Two species of birds make their nests and eat the fruits of the same kind of tree. One of the bird species is active in the late evening, and makes nests and eats fruits near the top of the tree. The other bird species is active in the dawn and early morning. It makes nests and eats fruits in the bottom tree branches. These two species inhabit
 - a. the same habitat and the same niche
 - b. the same habitat but different niches
 - c. different habitats but the same niche
 - d. different habitats and different niches
6. If no other changes occurred, how would emigration affect the population density of a group of organisms? _____

7. What biological process occurs after there has been a disturbance—such as a flood, or a tornado—in an established ecosystem?

Chapter 15: The Biosphere



Vocabulary

biosphere	grassland	neritic zone	estuary
biota	desert	bathyal zone	watershed
hydrosphere	deciduous	abyssal zone	littoral zone
atmosphere	coniferous	plankton	limnetic zone
geosphere	taiga	zooplankton	benthic zone
climate	tundra	phytoplankton	
microclimate	chaparral	coral reef	
canopy	intertidal zone	kelp forest	

Key Points...

- The biosphere is one of Earth's four interconnected systems.
- Climate is a key abiotic factor that affects the biosphere.
- Biomes are land-based, global communities of organisms.
- Marine ecosystems are global.
- Freshwater ecosystems include estuaries as well as flowing and standing water.

What you should know and be able to do...

1. Identify the biomes on the planet.
2. Create a model of a biome, including biotic and abiotic factors.

Chapter 15 Questions

15.1

15.2

15.3

15.4

15.5

Chapter 15: What do you already know?

Choose the letter of the best answer.

- _____ 1. The reactions in photosynthesis produce simple sugars and oxygen from sunlight and
- a. ATP.
 - b. hydrogen.
 - c. carbonic acid.
 - d. carbon dioxide.
- _____ 2. A group of organisms so similar to one another that they can reproduce fertile offspring is called a
- a. community.
 - b. pioneer species.
 - c. species.
 - d. population.
- _____ 3. Some bacteria have acquired a feature that allows them to live in very salty water. The feature is an example of a(n)
- a. operon.
 - b. phenotype.
 - c. vector.
 - d. adaptation.
- _____ 4. The Florida Everglades is an example of an aquatic
- a. ecosystem.
 - b. food chain.
 - c. community.
 - d. trophic level.
- _____ 5. Which of the following organisms in Figure 15.1 is a decomposer?

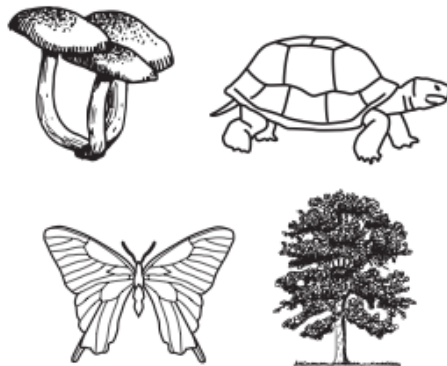


FIG. 15.1

- a. mushroom
 - b. butterfly
 - c. tree
 - d. tortoise
- _____ 6. When a giraffe eats leaves from a tree, it incorporates the leaves into its own
- a. biomass.
 - b. community.
 - c. niche.
 - d. biome.

_____ **7.** A species that has an unusually large effect on its ecosystem is a

- a.** predatory species.
- b.** dominant species.
- c.** keystone species.
- d.** pioneer species.

_____ **8.** Which best describes an organism's habitat?

- a.** what organisms it eats
- b.** how it behaves
- c.** where it lives
- d.** which food webs it is in

_____ **9.** Which of the following could the diagram in Figure 15.2 illustrate?

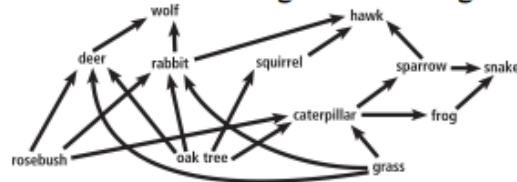


FIG. 15.2

- a.** hydrologic cycle
- b.** food web
- c.** evolution
- d.** energy pyramid

_____ **10.** Wind, temperature, and soil in an area help determine what can live in a particular environment. Such nonliving factors in an ecosystem are

- a.** abiotic factors.
- b.** vestigial structures.
- c.** limiting factors.
- d.** trophic levels.

SECTION | LIFE IN THE EARTH SYSTEM
15.1 | **Power Notes**

Earth System	Description

Scientists who contributed to the Gaia hypothesis:

- _____
- _____

Gaia hypothesis summary:

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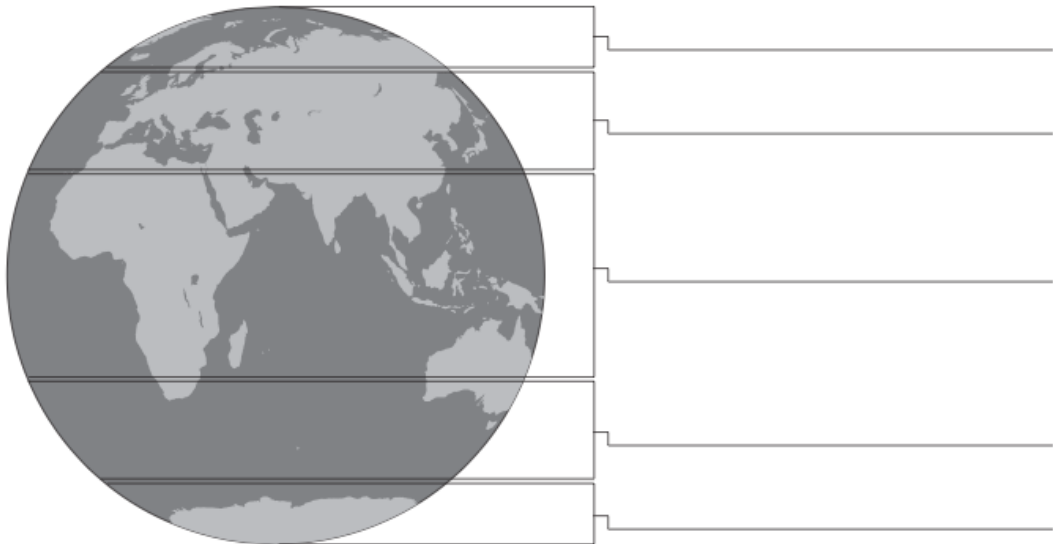
SECTION
15.2

CLIMATE
Power Notes

Climate is:

Microclimate is:

Climate Zones



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Factors that influence climate:

- _____
- _____
- _____

SECTION
15.3

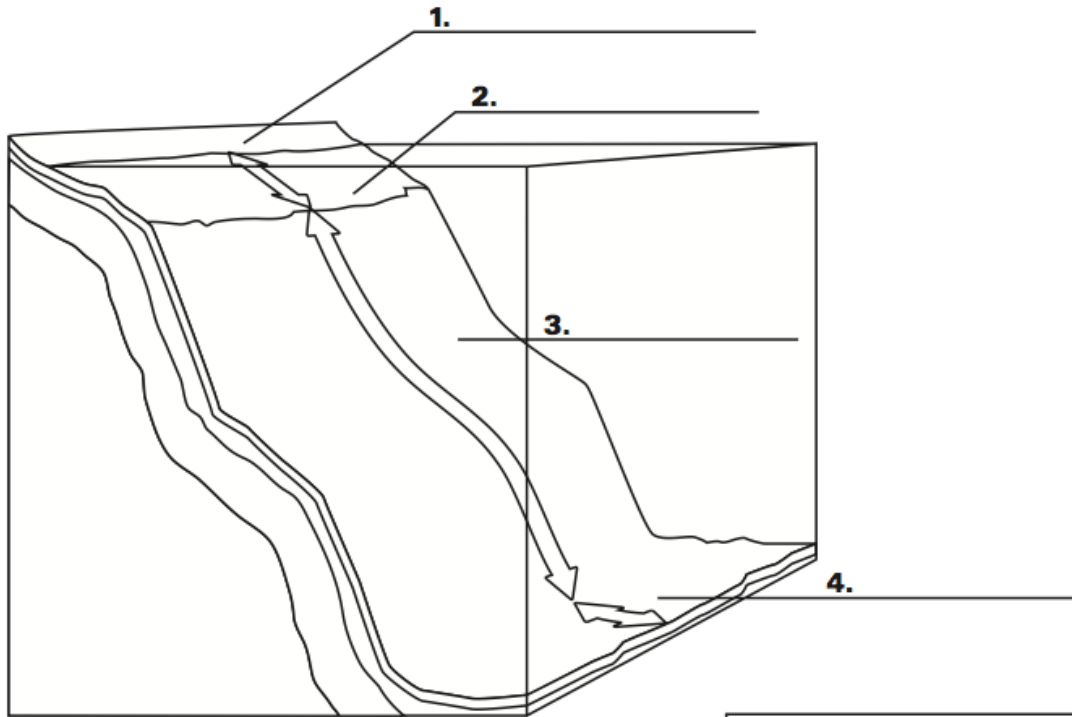
BIOMES
Power Notes

Tropical	Description
	<ul style="list-style-type: none"> • •
Grassland	
	<ul style="list-style-type: none"> • •
	<ul style="list-style-type: none"> • •
Desert	
	<ul style="list-style-type: none"> • •
Temperate	
	<ul style="list-style-type: none"> • •
	<ul style="list-style-type: none"> • •
Taiga	
	<ul style="list-style-type: none"> • •
Tundra	
	<ul style="list-style-type: none"> • •

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SECTION
15.4

MARINE ECOSYSTEMS
Power Notes



Two unique coastal habitats:

- _____
- _____

Description of Ocean Zones

1.

2.

3.

4.

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SECTION
15.5

ESTUARIES AND FRESHWATER ECOSYSTEMS
Power Notes

Definition	Description
Estuary	
Other Facts	Threats

Lake Zones

Zone	Description

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biosphere	grassland	neritic zone	estuary
biota	desert	bathyal zone	watershed
hydrosphere	deciduous	abyssal zone	littoral zone
atmosphere	coniferous	plankton	limnetic zone
geosphere	taiga	zooplankton	benthic zone
climate	tundra	phytoplankton	
microclimate	chaparral	coral reef	
canopy	intertidal zone	kelp forest	

A. Word Origins Circle the Greek and Latin word parts in each vocabulary term. Then use the Greek and Latin meanings to construct a very basic definition of the vocabulary word.

abyss- = bottomless	bio- = life	klima- = climate
atmos- = vapor	decidere = to fall off	limne = lake
bathy- = deep	geo- = earth	litor- = shore
benthos = bottom	hydro- = water	micros = small

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WORD	DEFINITION
1. atmosphere	
2. hydrosphere	
3. geosphere	
4. biosphere	
5. benthic zone	
6. limnetic zone	
7. littoral zone	
8. bathyal zone	
9. abyssal zone	
10. deciduous	
11. microclimate	

VOCABULARY PRACTICE, CONTINUED

B. Who Am I? Choose among these terms to answer the riddles below:

atmosphere	desert	kelp forest
canopy	deciduous	hydrosphere
chaparral	estuary	taiga
coniferous	geosphere	tundra
coral reef	grassland	watershed

The Biosphere

1. I am a type of tree that drops its leaves during autumn: _____
2. I am also called the boreal forest; I have long and cold winters: _____
3. I am an Earth system made up of all of Earth's water, ice, and water vapor: _____
4. I am also called the Mediterranean shrubland; I have hot, dry summers and cool, moist winters: _____
5. I am an area where the primary plant life is grass: _____
6. I am a unique coastal habitat found in cold, nutrient-rich waters; I am made up of communities of seaweed: _____
7. I am a partially enclosed body of water formed where a river flows into an ocean: _____
8. I am an Earth system made up of all the features on Earth's surface, including the continents, rocks, and sea floor; and everything below Earth's surface: _____
9. I am a type of tree that retains its needles all year long: _____
10. I am a biome located in far northern latitudes; I am covered by a layer of permafrost: _____
11. I am the uppermost branches of trees: _____
12. I am an Earth system made up of all the air that covers Earth: _____
13. I am a region that drains into a river, river system, or another body of water: _____
14. I am a biome with a very dry, arid climate: _____
15. I am a unique coastal habitat found in the tropical zone; I support large communities of tropical fish: _____

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VOCABULARY PRACTICE, CONTINUED

C. Put It in a Box For each vocabulary term, fill in the box with words that will help you to remember its meaning.

DECIDUOUS

1. _____

TUNDRA

2. _____

CHAPARRAL

3. _____

CONIFEROUS

4. _____

TAIGA

5. _____

ESTUARY

6. _____

DESERT

7. _____

BIOSPHERE

8. _____

CLIMATE

9. _____

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Chapter 15 Review



1. Label Earth's three main climate zones at the right.

2. How do the three climate zones differ?

3. In which climate zone is the tundra biome located? _____

4. What is one way in which deciduous and coniferous trees differ?

5. Which ocean zone contains the greatest biodiversity and the most ocean life?

- a. the intertidal zone
- b. the neritic zone
- c. the bathyal zone
- d. the abyssal zone

6. What is one way in which oxygen moves between the biosphere and the atmosphere in an ecosystem?

- a. through decomposition and nitrogen fixation
- b. through biotic adaptations
- c. through photosynthesis and respiration
- d. oxygen is abiotic, and does not cycle through the biosphere

7. How has human activity affected estuary ecosystems? _____

8. Give an example of how the biosphere, atmosphere, hydrosphere, and geosphere interact in Earth's ecosystems. _____

Chapter 16: Human Impact on Ecosystems



Vocabulary

nonrenewable resource

renewable resource

ecological footprint

pollution

smog

particulate

acid rain

greenhouse effect

global warming

indicator species

biomagnification

habitat fragmentation

introduced species

sustainable development

umbrella species

Key Points...

- As the human population grows, the demand for Earth's resources increases.
- Fossil fuel emissions affect the biosphere.
- Pollution of Earth's freshwater supply threatens habitat and health.
- The impact of a growing human population threatens biodiversity.
- Conservation methods can help protect and restore ecosystems.

What you should know and be able to do...

1. Explain the importance of biodiversity.
2. List and describe several threats to biodiversity.
3. Describe how a single species can affect an entire ecosystem.
4. Evaluate the methods used to conserve biodiversity.
5. Identify renewable and nonrenewable resources and predict how the loss of each might affect the biome.
6. Research how human activities affect the biosphere, identifying environmental and human costs and benefits: deforestation, climate change, pollution, land use, etc.
7. Investigate how humans may be impacted if global climate changes were to occur.
8. Develop ways humans can change their impact on global climate changes and other environmental effects on the planet.

Chapter 16 Questions

16.1

16.2

16.3

16.4

16.5

Chapter 16: What do you already know?

Choose the letter of the best answer.

- _____ 1. An area that stores carbon over a long period of time is called a(n)
a. carbon sink. **c.** carbon sequester.
b. carbon fixation. **d.** aquifer.
- _____ 2. The pH of a solution depends on the concentration of
a. carbon molecules. **c.** chlorine atoms.
b. basic elements. **d.** hydrogen ions.
- _____ 3. Some bacteria have an adaptation that allows them to resist antibiotics. These bacteria continue to reproduce, but bacteria without the adaptation die. This is an example of
a. infectious disease. **c.** gradualism.
b. natural selection. **d.** decomposition.
- _____ 4. If a population has no known predators and plenty of available resources, how might that population change?
a. It would increase. **c.** It would remain the same.
b. It would decrease. **d.** It would spread out.
- _____ 5. A diagram like the one shown in Figure 16.1 can be used to illustrate an energy pyramid. What do the steps of the pyramid represent?

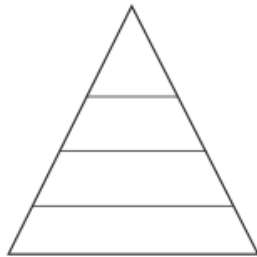


FIG. 16.1

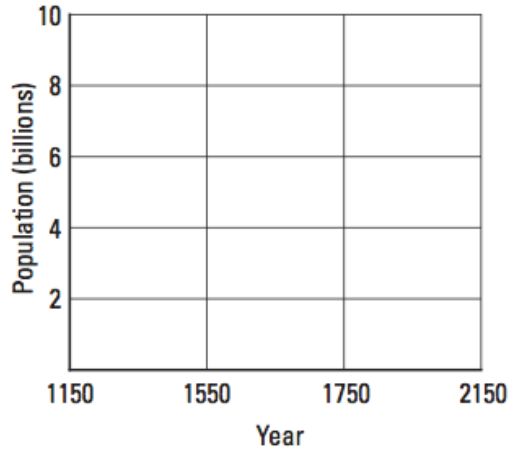
- a.** various decomposers **c.** trophic levels
b. four elements **d.** abiotic factors
- _____ 6. Which of the following processes returns carbon to the atmosphere in the form of carbon dioxide?
a. cellular respiration **c.** hydrologic cycle
b. photosynthesis **d.** mitosis

SECTION
16.1

HUMAN POPULATION GROWTH AND NATURAL
RESOURCES

Power Notes

World Population



Two technological advancements that have contributed to population growth:

-
-

Types of Resources

Resource Type	Description

Ecological Footprint

Definition:

-

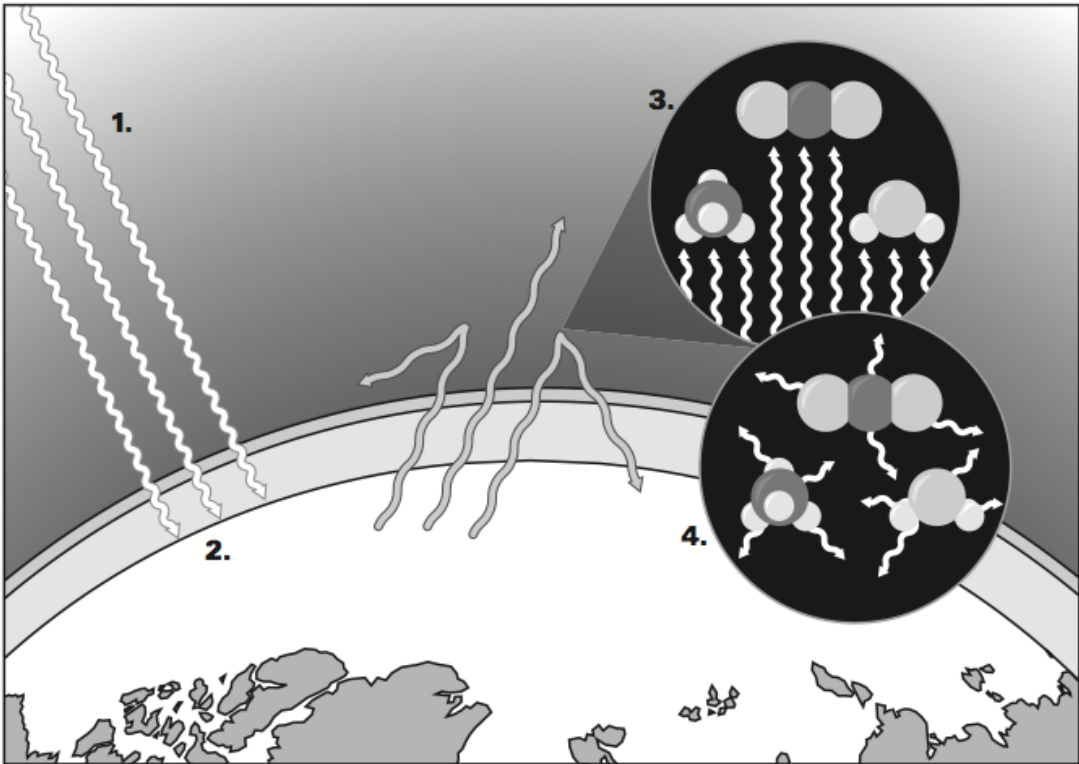
Size depends on:

-

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SECTION 16.2 | AIR QUALITY
Power Notes

Greenhouse effect occurs when:



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1.

3.

2.

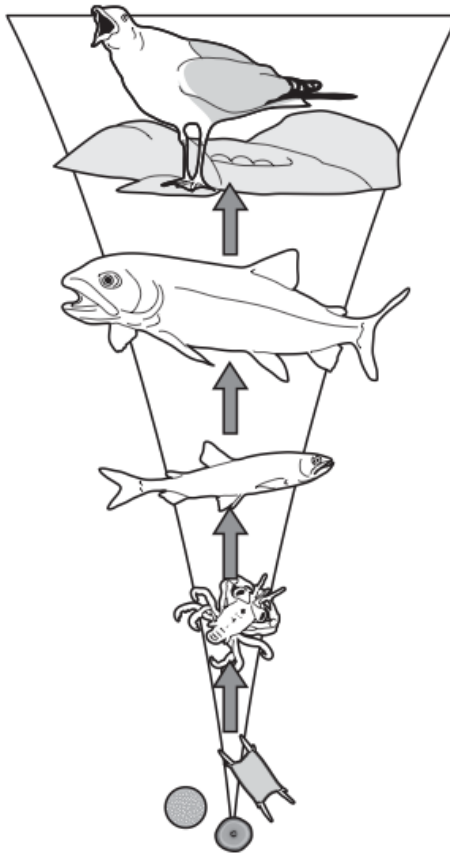
4.

SECTION 16.3 | WATER QUALITY
Power Notes

An indicator species is:

Biomagnification is:

Pollutant Concentration
(Draw an arrow from low to high concentration.)



Trophic Level

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SECTION
16.4 | THREATS TO BIODIVERSITY
Power Notes

Why biodiversity is important:

-
-
-

Threats to Biodiversity

Habitat fragmentation:

Introduced species:

Species	Where Introduced	Problems Caused

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SECTION
16.5

CONSERVATION
Power Notes

Sustainable development is:

Sustainable practices in the fishing industry:

-
-
-
-

An umbrella species is:

Three important environmental laws:

-
-
-

Ways in which humans can protect the environment:

-
-
-
-

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nonrenewable resource
renewable resource
ecological footprint
pollution
smog

particulate
acid rain
greenhouse effect
global warming
indicator species

biomagnification
habitat fragmentation
introduced species
sustainable development
umbrella species

A. Categorize Words Write “R” next to words that can describe renewable resources. Write “N” next to words that can describe nonrenewable resources.

- | | | |
|----------------|----------------|------------|
| 1. ____ wind | ____ sunlight | ____ oil |
| 2. ____ coal | ____ petroleum | ____ water |
| 3. ____ forest | ____ deer | ____ fish |

4. What is the difference between a renewable and a nonrenewable resource?

B. Who Am I? Choose among these terms to answer the riddles below:

ecological footprint	indicator species	smog
global warming	introduced species	umbrella species

- I am an organism that was brought into an ecosystem by humans and I can cause a lot of damage to native plants and animals that already live there: _____
- I am the amount of land required to produce and maintain enough food and water, shelter, energy, and waste to support each person on Earth: _____
- I am a type of air pollution: _____
- I am a species that is sensitive to environmental changes and can provide a sign of the quality of my ecosystem’s environmental conditions: _____
- I am the trend of increasing global temperatures: _____
- I am a species that, if protected, will cause a number of other species to be protected as well: _____

C. Matching Write the vocabulary term next to its definition.

acid rain	biomagnification	particulate	pollution
-----------	------------------	-------------	-----------

- _____ 1. Any undesirable factor added to the air, water, or soil.
- _____ 2. The process in which fat-soluble pollutants move from one organism to another, increasing in concentration as it moves up the food chain.
- _____ 3. A microscopic bit of dust, metal, or unburned fuel.
- _____ 4. A type of precipitation produced when pollutants in the water cycle cause rain pH to drop below normal levels.

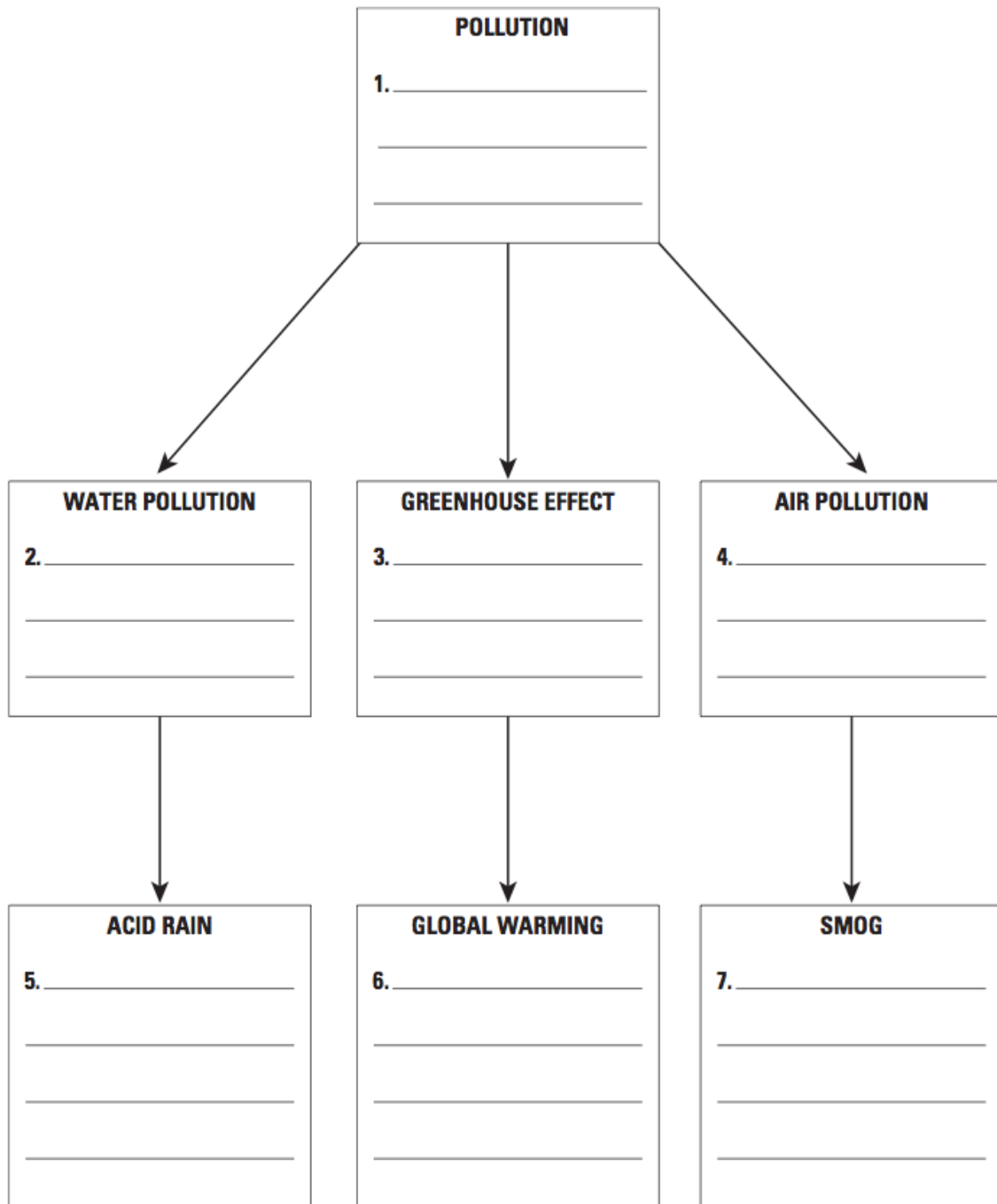
ecological footprint	global warming	greenhouse effect	nonrenewable resource
----------------------	----------------	-------------------	-----------------------

- _____ 5. Occurs when CO₂, water, and methane molecules absorb energy reradiated by Earth's surface and slow the release of this energy from Earth's atmosphere.
- _____ 6. The amount of land necessary to produce and maintain enough food and water, shelter, energy, and waste to support each person on Earth.
- _____ 7. The trend of increasing global temperatures.
- _____ 8. Resources that are used faster than they can form.

habitat fragmentation	indicator species	introduced species	sustainable development
-----------------------	-------------------	--------------------	-------------------------

- _____ 9. Occurs when a barrier forms that prevents an organism from accessing its entire home range.
- _____ 10. A practice in which natural resources are used and managed in a way that meets current needs without hurting future generations.
- _____ 11. Any organism that was brought to an ecosystem as a result of human actions.
- _____ 12. A species that provides a sign of the quality of an ecosystem's environmental conditions.

D. Vector Vocabulary Define the words in the boxes.



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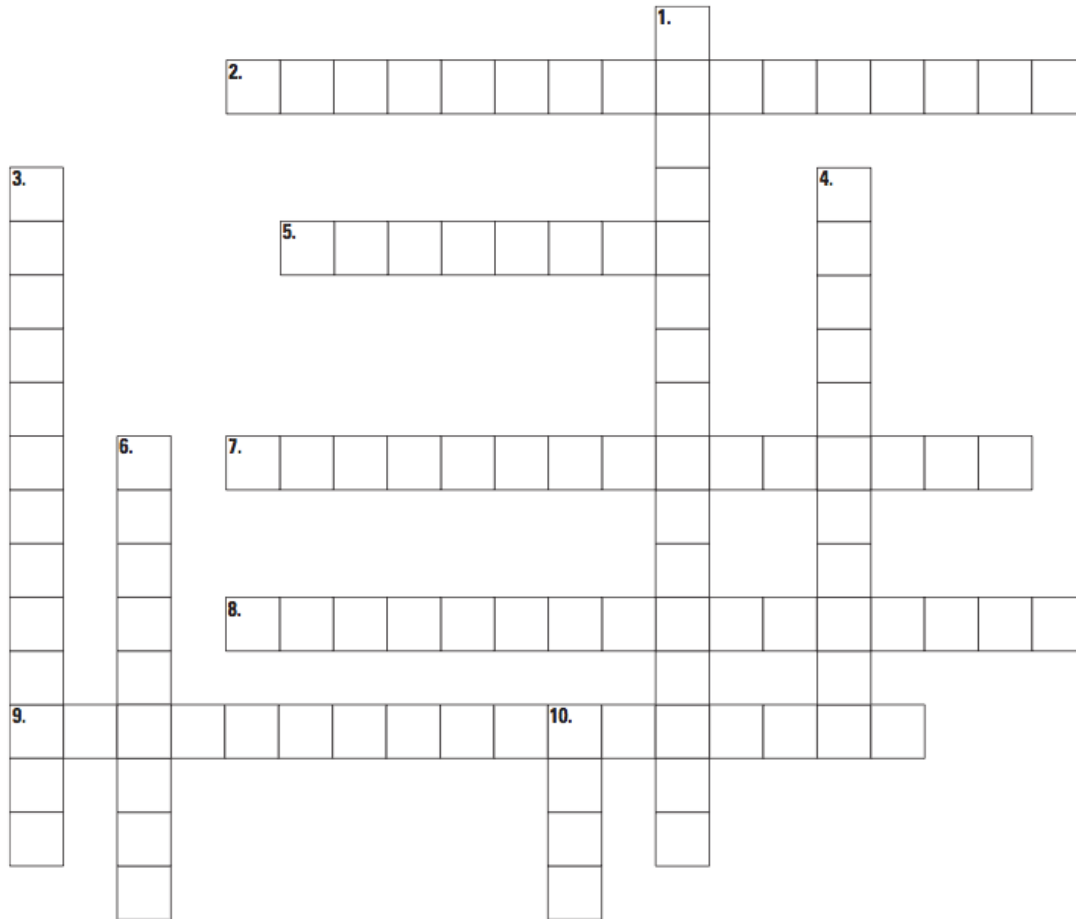
E. Crossword Puzzle Use the clues to solve the puzzle.

Across

- 2. Type of species that is sensitive to changes in its environment
- 5. Type of precipitation with a low pH caused by pollutants in the air
- 7. A species whose protection results in the protection of a number of other species
- 8. Process that results in a high concentration of pollutants in the body of a tertiary consumer
- 9. Kudzu in the United States

Down

- 1. A process that keeps heat from escaping Earth's atmosphere
- 3. Trend of increasing global temperatures
- 4. A tiny bit of dust, metal, or unburned fuel in the air
- 6. Smog, acid rain, or trash on a beach
- 10. Brown haze in the air caused by pollution



Chapter 16 Review

1. Which energy source is more sustainable—renewable resources or nonrenewable resources? Explain your response. _____

2. Wood can be a renewable resource. Under what conditions might wood become a *nonrenewable* resource? _____

3. How does a growing human population threaten Earth's resources?

4. Toxins accumulate in high-level consumers through _____.
 - a. smog
 - b. particulates
 - c. indicator species
 - d. biomagnification
5. How can the protection of just one species, such as the manatee, benefit other species in the same habitat? _____

6. The opposite of a native species is
 - a. an introduced species
 - b. an indicator species
 - c. a predator
 - d. an umbrella species
7. What is the main goal of sustainable development? _____

