Chapter 5

Answers to Section 1 Review

1. Energy is transferred from producers to consumers when consumers eat producers. Consumers also gain energy by eating other consumers. Decomposers gain energy by breaking down dead producers and consumers.
2. Producers such as plants, algae, and some bacteria capture and convert energy into a form that is usable by other organisms.
3. An herbivore only eats producers. An omnivore eats both producers and consumers.
4. Energy transfer in a food chain is linear and represents different trophic levels, from producers to consumers. Energy transfer in a food web is complex and contains many food chains.
5. The crabeater seal eats herring, which eats both krill and algae. The crabeater seal is eaten by the killer whale and leopard seal.
6. Yes. As you move up trophic levels, 90 percent of available energy is lost at each level. The crop stores 10 times more energy than herbivores in the same area, so there is more energy for humans to use if they eat lower on the food chain.

Answers to Section 2 Review

1. Producers convert carbon dioxide to carbohydrates during photosynthesis. Carbon is then passed on to consumers when they eat producers and other consumers. Producers and consumers release carbon dioxide back into the atmosphere during cellular respiration.
2. Fossil fuels contain carbon from plants and animals that died millions of years ago. When fossil fuels are burned, they release carbon into the atmosphere.
3. Excess use of fertilizer containing nitrogen and phosphorus can enter aquatic ecosystems in runoff, causing algal blooms which deplete them of oxygen.
4. Phosphorus is rarely cycled in the atmosphere, because it rarely occurs as a gas. Gases, such as atmospheric carbon and nitrogen, are easily exchangeable.
5. Some bacteria take in carbon dioxide during photosynthesis and release carbon dioxide during cellular respiration in the carbon cycle. Bacteria take in and fix nitrogen for other organisms to use in the nitrogen cycle. Decomposing bacteria also release carbon, nitrogen and phosphorus back into the environment.
6. Answers may vary.

Answers to Section Review

1. Primary succession occurs on a surface where no ecosystem previously existed. Secondary succession occurs on a surface where an ecosystem previously existed.
2. Pioneer species are the first organisms to colonize any newly available area and begin the process of ecological succession.
3. Some communities rely on fire to reproduce or eliminate invading species. Putting out forest fires in these communities will cause them to be taken over by other species and change into a different community.
4. Lichens can live without soil, so they colonize bare rock and begin to break it down through physical and chemical processes.
5. secondary succession; primary succession only occurs in areas where there was no previous ecosystem
6. Lichens and the first old-field succession plants are pioneers. Lichens, however, do not need soil to colonize an area.

Chapter 5 Review

Using Key Terms

1. Sample answer: Photosynthesis uses carbon dioxide, water, and energy to produce sugars and oxygen.
2. Sample answer: In an aquatic ecosystem, algae are in the bottom trophic level.
3. Sample answer: Organisms add carbon to the carbon cycle during cellular respiration.
4. Sample answer: Nitrogen-fixing bacteria live inside the root nodules of legumes.
5. Sample answer: Decomposers break down dead organic matter.
6. A producer is an organism that makes its own food. A consumer is an organism that gets its energy by eating other organisms.
7. Primary succession is a type of succession that occurs on a surface where no ecosystem existed before. Secondary succession occurs on a surface where an ecosystem has previously existed.

8. The nitrogen cycle is the movement of nitrogen between the atmosphere, bacteria, and other organisms. The phosphorus cycle is the movement of phosphorus from the environment to organisms and back.
9. A food chain is a sequence in which energy is transferred from one organism to another. A food web is made up of many food chains and shows the possible feeding relationships in an ecosystem.

Understanding Key Ideas

10. c
11. c
12. d
13. a
14. c
15. c
16. b
17. c
18. b

Short Answer

19. Answers may vary. Cellular respiration provides the carbon dioxide that fuels photosynthesis; photosynthesis provides the oxygen that fuels cellular respiration.
20. Answers may vary. A large amount of energy is lost at each level, so there has to be a limit on the number of trophic levels. For example, in an African savanna ecosystem, animals that are larger than lions and that eat lions do not exist, because there is not enough energy to support a trophic level higher than lions on the African savanna.
21. Answers may vary. If decomposers did not exist, dead organic matter would not be broken down. Also, carbon, nitrogen, and other nutrients essential to life would stay in an unusable form and nutrients would not be cycled in ecosystems.
22. Answers may vary. Phosphorus rarely occurs as a gas. And phosphorus takes a long period of time to weather from rock. Phosphorus in water gets trapped in an unusable form called phosphate, which sinks to the bottom of the ocean and lakes. Much of the phosphorus on Earth is locked in the form of phosphatebearing rock.
23. Answers may vary. Carbon dioxide gas is released into the atmosphere by the process of cellular respiration and by combustion reactions. Plants use carbon dioxide from the atmosphere to make carbohydrates during photosynthesis.

Interpreting Graphics

24. four
25. The elephant seal population might decrease because the killer whale would have to hunt more of the seals to make up for the loss of penguins as prey.
26. Algae are the base food for the entire food web.

Concept Mapping

27. Answers to the concept mapping questions are on pp. 715–720.

Critical Thinking

28. Producers transform chemicals into a form usable by consumers; decomposers transform dead organisms back to chemicals that producers can use.
29. Mesquite is a legume and has nitrogen-fixing bacteria in its roots that enrich the soil.
30. Decomposers are considered to be consumers because they get their food by breaking down dead organisms. Therefore, they depend on other organisms to gain energy.
31. Producers may flourish, because they are not being eaten, but secondary consumers would dwindle and die or move out of the area. Primary consumers from a different area may be attracted to the area of high primary production, and their predators may follow. This type of an event would probably change the ecosystem significantly.

Cross-Disciplinary Connection

32. The total mass for the pike would be 600 kg. Since each trophic level loses 90% of its energy, this would be a system with 4 trophic levels (1st level _ 600,000 kg, 2nd level _ 60,000 kg, 3rd level _ 6000 kg,

4th level (pike) _ 600 kg).

Portfolio Project

33. Answers may vary.

Math Skills

34. 137.25 _ 0.52% _ 71.37 million metric tons

35. The graph should be arranged from lowest to highest use. The countries should be on the *x*-axis and percentage should be on the *y*-axis.

Writing Skills

36. Answers may vary. Be sure that students link the cycles to the foods they eat and the waste materials they excrete.

37. Students may want to review the Kyoto Protocol on the Web. The Kyoto Protocol is an international agreement to reduce CO_2 emissions.

Reading Skills

1. d

2. c

Standardized Test Prep Answers

1. B

2. G

3. D

4. G

5. Answers will vary. See Test Doctor for detailed scoring rubric.

6. D

7. I

8. Answers will vary. See Test Doctor for detailed scoring rubric.

9. B

10. F

11. C