

Section Review 3-1

1. a **2.** e **3.** c **4.** d **5.** b **6.** Observation is important because it is often the first step in asking ecological questions. **7.** Scientists use experimenting to test hypotheses. **8.** Modeling is helpful because it enables scientists to gain insight into very large or complex phenomena. **9.** Interactions among organisms within the biosphere create interdependence between organisms and their environment. **10.** Possible student answer: Experiments answer questions using controls and variables; observations do not use variables and controls but use the senses to collect data.

Section Review 3-2

1. The sun is the main source of energy used by life on Earth. **2.** Some organisms use the energy stored inside inorganic compounds. **3.** Energy flows through an ecosystem in one direction, from the sun to autotrophs and then to heterotrophs. **4.** About 10% of the energy at any level is available to the next level. **5.** algae **6.** zooplankton, small fish, squid, shark **7.** Autotrophs use the energy from sunlight and chemicals to produce their own food. **8.** Herbivores, carnivores, and omnivores differ in the types of food that they consume. Herbivores eat only plants, while carnivores eat only animals. Omnivores eat both plants and animals. **9.** A food chain is made of a series of steps in which organisms transfer energy by eating and being eaten. A food web is a more complex network of interactions, which links together all the food chains in an ecosystem. **10.** Fifty kilograms of human tissue would exist at a fourth trophic level.

Section Review 3-3

1. Energy flows in one direction through ecosystem, whereas matter is recycled within an ecosystem. **2.** Nutrients are passed between organisms and the environment through biogeochemical cycles. **3.** The land allows precipitation either to run off into large bodies of water or to enter plants through the soil, so that the water cycle begins again. The land may also retain water that has seeped deep below the surface as groundwater. **4.** The main sources of carbon dioxide in the atmosphere are respiration of animals, human activity, decomposition of organic matter, and volcanic activity. **5.** Without bacteria to perform denitrification, ammonia would accumulate in the soil, unable to return, as nitrogen, to the atmosphere. **6.** The proteins of all living organisms contain nitrogen atoms. Nitrogen fixation is the beginning of the process that makes nitrogen available to organisms building proteins. **7.** Bacteria convert atmospheric nitrogen into ammonia, and then into the nitrites and nitrates that are useful to producers in making proteins. **8.** When plants absorb inorganic phosphate, they bind the phos-

phate in organic compounds. This organic phosphate then moves through the food web from producers to consumers, and to the rest of the ecosystem. **9.** Unlike carbon and nitrogen in their cycles, phosphorus never enters the atmosphere in the phosphorus cycle. **10.** Nitrogen is usually the limiting nutrient in saltwater, while phosphorus is usually the limiting nutrient in freshwater.

Chapter Vocabulary Review

1. Ecology is the study of interactions among organisms and between organisms and their environment. **2.** The biosphere contains the combined portions of Earth where all life exists. **3.** A species is a group of organisms so similar to one another that they can breed and produce fertile offspring. **4.** A community is the assemblage of different populations that live together in a defined area. **5.** A biome is a geographical region that contains several ecosystems that have the same climate and dominant communities. **6.** An autotroph uses the energy from sunlight or chemicals to produce food. **7.** d **8.** c **9.** b **10.** a **11.** c **12.** d **13.** a **14.** c **15.** a **16.** b **17.** a **18.** biogeochemical **19.** evaporation **20.** transpiration **21.** nutrient **22.** nitrogen fixation **23.** denitrification **24.** primary productivity **25.** limiting nutrient

Enrichment

1. Phosphates are in bones, in cell membranes, and in RNA and DNA. Phosphates enter your body in the food you eat. **2.** The phosphate cycle and the nitrogen cycle are both nutrient cycles. The nitrogen cycle is a gaseous cycle; the phosphorous cycle is a sedimentary cycle.

Graphic Organizer

1. evaporate **2.** condenses **3.** precipitation **4.** rivers **5.** streams **6.** ocean

Real-World Lab

Analyze and Conclude 1. The phosphate greatly increased the growth of the algae. **2.** Yes, the results indicate that phosphate is a limiting nutrient for algae. **3.** Possible student answer: My results did support my hypothesis that the phosphate would increase the growth of the algae. There was clearly more algae in the “phosphate” test tube. **4.** Water polluted by high phosphate detergents would probably contain a heavy green overgrowth of algae.