Chapter 19
Ecology, Ecosystems, and the Environment: Are human activities affecting the global environment?

1. The flow of energy in an ecosystem
   a. decreases by 90% at each trophic level.
   b. is a discrete amount transferred without change.
   c. transfers from plants to carnivores to herbivores.
   d. is wasted by the decomposers.
   e. all of the above

   Ans: a
   Link To: Ecology and Ecosystems
   Difficulty Level: Easy

2. Which of the following initiated the law of unintended consequences at Lake Victoria in Africa?
   a. clear cutting of old growth pine trees
   b. building jetties on the Lake Victoria shore
   c. introducing the Nile perch
   d. growing algae for aquaculture
   e. constructing lake-front apartments

   Ans: c
   Link To: The Law of Unintended Consequences
   Difficulty Level: Easy

3. Urban landfills use procedures that
   a. increase the decay rate for most trash.
   b. accelerate the process by which aluminum is recycled.
   c. decrease the decomposition rate for newspapers.
   d. increase the number of aerobic bacteria.
   e. make it cost effective to recycle glass.

   Ans: c
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy
4. A national recycling program is inhibited by
   a. lack of a market for some recycled products.
   b. the fact that each type of trash requires a unique chemical process to be recycled.
   c. the sheer volume of trash needing to be processed.
   d. America's "use it and lose it" attitude.
   e. all of the above

   Ans: e
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy

5. Which term refers to the particular way an organism obtains energy?
   a. ecosystem
   b. environment
   c. ecology
   d. ecological niche
   e. habitat

   Ans: d
   Link To: The Law of Unintended Consequences
   Difficulty Level: Easy

6. Which statement about an ecosystem is correct?
   a. Organisms get their energy from the same trophic level.
   b. Ecosystems are formed from only living parts.
   c. Matter is recycled by an ecosystem.
   d. Organisms can occupy more than one niche in an ecosystem.
   e. Ecosystems are in a balance of nature.

   Ans: c
   Link To: Ecology and Ecosystems
   Difficulty Level: Easy

7. According to the equilibrium hypothesis, introducing a new species to an isolated ecosystem will
   a. cause another species to go extinct.
   b. cause a depletion of oxygen.
   c. make other species stronger by increasing competition.
   d. add to the diversity of the ecosystem
   e. have no impact on the ecosystem.
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Ans: a
Link To: The Law of Unintended Consequences
Difficulty Level: Easy

8. Research by Daniel Simberloff and E.O. Wilson supported the theory of island biogeography when, at the end of the experiment,
   a. their mangrove research site failed to return to its status as a viable ecosystem.
   b. a hurricane destroyed the native population of brown lizards on the mangrove island.
   c. the island biota were replaced by similar but different species of animals.
   d. the state of Florida fined the research team for breaking environmental laws.
   e. the mangrove research site flourished with the biodiversity that came from introduction of new species.

Ans: c
Link To: The Law of Unintended Consequences
Difficulty Level: Easy

9. The amount of solid waste produced by an average American each year equals
   a. the weight of two large dump trucks.
   b. the volume of the Statue of Liberty.
   c. 17,000 tons.
   d. much less than was produced before recycling efforts began.
   e. an amount that would fill the Grand Canyon.

Ans: a
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

10. The value of the ozone layer to Earth's citizens is
    a. protection from ultraviolet rays.
    b. to neutralize the NOx molecules in acid rain.
    c. to prevent acid rain.
    d. to mediate temperatures in the stratosphere.
    e. all of the above

Ans: a
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy
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11. What were the principles of the Kyoto accords?
   a. protection of the endangered Kyoto lizard
   b. depletion of ozone concentrations over Alaska
   c. phasing out of CFCs in manufacturing
   d. decrease in CO₂ emissions on a global scale
   e. redesigning nuclear plants

   Ans: d
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy

12. Which are products of burning fossil fuels in the atmosphere?
   a. carbon dioxide and water
   b. nitrogen oxides and sulfur compounds
   c. water vapor and sulfur compounds
   d. carbon dioxide and NOx
   e. all of the above

   Ans: e
   Link To: Ecology and Ecosystems
   Difficulty Level: Easy

13. How far above the Earth would we find the highest concentration of "good" ozone?
   a. 50 miles
   b. 20 miles
   c. 10 miles
   d. 10,000 feet
   e. sea level

   Ans: b
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy

14. The creation of NOx requires nitrogen, oxygen, and
   a. water.
   b. heat.
   c. sulfur.
   d. acid rain.
   e. xylene.
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Ans: b
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

15. How are CFCs dangerous to the environment?
   a. causing acid rain
   b. blocking sunlight
   c. breaking O3 to create O2
   d. accelerating glaciations
   e. increasing cloudiness

   Ans: c
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy

16. What were the results of the Montreal treaty of 1986?
   a. All U.S. factories would retrofit smokestacks with scrubbers.
   b. Industrial nations would decrease, then stop their production of CFCs.
   c. Canada would limit their use of natural gas.
   d. Strict guidelines were written on automobile emissions.
   e. Chemical companies producing Freon went out of business.

   Ans: b
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy

17. Acid rain is known to cause problems by
   a. causing population explosions of deer species.
   b. triggering glaciations and ice sheets.
   c. bleaching chlorophyll from green plants.
   d. destroying statues and limestone buildings.
   e. accelerating global warming.

   Ans: d
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Easy
18. An ecosystem can be as large as the Earth and as small as an aquarium.

Ans: True
Link To: Ecology and Ecosystems
Difficulty Level: Easy

19. A list of ecosystem components would include the abiotic as well as the biotic parts.

Ans: True
Link To: Ecology and Ecosystems
Difficulty Level: Easy

20. The ozone levels must be sampled directly from aircraft flying into the region under study.

Ans: False
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

21. Chlorofluorocarbons replaced Freon as a coolant in air conditioners and refrigerators.

Ans: False
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

22. The Everglades Restoration Plan will change the flow of water in Florida.

Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

23. Since introducing Nile perch to Lake Victoria, the shore tree density has decreased.

Ans: True
Link To: The Law of Unintended Consequences
Difficulty Level: Easy

24. The United States did not sign the international Kyoto accord.
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Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

25. Scientists are unable to predict the consequences of the greenhouse effect with certainty.

Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

26. The treaty that came out of the 1986 international environmental conference in Montreal called for an immediate global ban on chlorofluorocarbons.

Ans: False
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

27. Carbon dioxide causes the rainfall to be naturally acidic.

Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

28. Without the greenhouse effect, the Earth's average temperature would be -20°C.

Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

29. Global climate models are not reliable for long-term predictions because the resolution of the data cells is too coarse.

Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Easy

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30. How are scientists determining atmospheric ozone levels?
   a. measuring spectral lines from satellites
   b. collecting samples with specially outfitted airplanes
   c. analyzing data collected in ground-based labs
   d. all of the above
   e. only a & b

   Ans: d
   Link To: Threats to the Global Ecosystem and Environment
   Difficulty Level: Medium

31. Which example would best demonstrate the "law of unintended consequences"?
   a. building levees on the Mississippi River
   b. working with two reactive substances in chemistry class
   c. establishing a nature preserve in a wilderness area
   d. frequenting a fast-food restaurant
   e. talking to a friend on a cell phone

   Ans: a
   Link To: The Law of Unintended Consequences
   Difficulty Level: Medium

32. Which of these groups are listed as first, second, and third trophic level order, respectively?
   a. sea grass, beetle, fern
   b. rose, aphid, exterminator
   c. grass, deer, mountain lion
   d. phytoplankton, whale, vulture
   e. fern, Brontosaurus, hominid

   Ans: c
   Link To: Ecology and Ecosystems
   Difficulty Level: Medium

33. Why is any effort to control the greenhouse effect so difficult?
   a. The global economy depends on fossil fuels.
b. The greenhouse effect is a natural phenomenon necessary to keep the average temperature on Earth above freezing.
c. The global climate models are not yet dependable enough to determine energy policy.
d. There is no reliable substitute energy source available to the average citizen to replace fossil fuels on a global scale.
e. All of the above describe the complexity of the issue.

Ans: e
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Medium

34. Why do scientists believe that global warming is occurring?
a. 15 of 20 years since 1980 were warmer than normal
b. sea level is rising
c. glaciers are melting
d. 1998 was the warmest year on record
e. all of the above

Ans: e
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Medium

35. What do scientists think will happen if the Earth’s atmospheric carbon dioxide levels are doubled?
a. Earth’s average temperature will increase 2°C to 6°C.
b. The oceans will take up the extra carbon dioxide.
c. The plants will increase in biomass productivity.
d. The Earth will become cloudier.
e. all of the above

Ans: e
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Medium

36. What are some ideas proposed to decrease global warming?
a. limit the burning of fossil fuels
b. pass laws with strict auto emissions limits
c. nothing; global warming is a natural process
d. plant trees to take in extra CO2
e. all of the above
37. The total warming in the northern hemisphere since the last ice age is 5°F.

Ans: False
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Medium

38. Earth's atmosphere is transparent to visible light and ultraviolet but opaque to infrared wavelengths.

Ans: True
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Medium

39. Life moved to land on Earth only after the greenhouse shield formed, several hundred million years ago.

Ans: False
Link To: Ecology and Ecosystems
Difficulty Level: Medium

40. Carbon dioxide protects the Earth's surface from harmful radiation.

Ans: False
Link To: Ecology and Ecosystems
Difficulty Level: Medium

41. The ozone hole was first detected over Antarctica because of a chlorine research project located there.

Ans: False
Link To: Threats to the Global Ecosystem and Environment
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Difficulty Level: Medium

42. It takes more than 100 years for an economy to change its industrial and municipal fuel choices.

Ans: False
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Medium

43. Explain what is meant in ecology by the concept of “interdependent systems.”

Ans: “Interdependent systems” is the concept of interrelatedness of all parts of an ecosystem. This concept implies that the whole ecosystem responds to — and can be changed by — any and every stimulus.
Link To: Ecology and Ecosystems
Difficulty Level: Medium

44. Define and give an example of the “law of unintended consequences.”

Ans: The law of unintended consequences is a phenomenon that demonstrates that it is impossible to change one part of an ecosystem without changing something else, often inadvertently. The textbook uses Lake Victoria and the introduced Nile perch example.
Link To: The Law of Unintended Consequences
Difficulty Level: Medium

45. Describe a naturally occurring experiment in island biogeography.

Ans: The book describes a hurricane in 1995 that blew iguanas to another island 200 miles away. The introduced iguana species is now competing for resources and niche space with the native iguana species.
Link To: The Law of Unintended Consequences
Difficulty Level: Medium

46. Why is the ozone hole located where it is?
Ans: Over Antarctica, where the ozone hole was first noticed, the annual depletion of ozone is preceded by several months of complete darkness. During this time, chemical reactions occur that prepare for the final breakdown of ozone. Once the sunlight returns, the destruction of ozone takes place quickly, creating a deficit of ozone in the upper atmosphere.

Link To: Threats to the Global Ecosystem and Environment

Difficulty Level: Medium

47. What determines the pH of normal rainfall?

Ans: Although nitrogen and sulfur compounds in the air create acid rain, normal rainfall is slightly acidic because the carbon dioxide in the air dissolves in the raindrops and creates mild carbonic acid. The pH of normal rainfall is 5.6.

Link To: Threats to the Global Ecosystem and Environment

Difficulty Level: Medium

48. Is acid rain only common in areas of industrialization? Why or why not?

Ans: Higher smoke stacks sent pollution up into prevailing winds allowing acid rain to fall hundreds of miles from where the pollutants were produced.

Link To: Threats to the Global Ecosystem and Environment

Difficulty Level: Medium

49. Ecology in many respects is a study of energy flow through the environment. Account for the energy flow from trophic level to trophic level in terms of conservation laws.

Ans: The energy transmission from level to level is rather inefficient transmitting within an efficiency of only about 10%. The other 90% is lost to the environment and eventually to space as waste heat.

Link To: Ecology and Ecosystems

Difficulty Level: Medium

50. In what manner are the organisms at the first trophic level the most important for the planet?

Ans: This is the base translation of sunlight to energy that can be utilized by other organisms.

Link To: Ecology and Ecosystems

Difficulty Level: Medium
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51. In what manner does E. O. Wilson’s model of island biogeography help us to understand the world after the demise of the dinosaurs approximately 65 million years ago?

Ans: The extinctions open up new opportunities for once excluded organisms to occupy new niches.

Link To: The Law of Unintended Consequences
Difficulty Level: Medium

52. If the annual temperature of Washington DC warms two degrees Celsius, its climate would be most like
a. Montana.
b. California.
c. Georgia.
e. Missouri.

Ans: c

Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard

53. What did Edward Wilson and Daniel Simberloff learn in the mangroves of south Florida during a classic ecology experiment?

Ans: Whenever a new species migrates to an island that already has homeostasis, a native species will become extinct if the new species survives. This is because of the problem of niche overlap.

Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard

54. What contributes to the slow decomposition rates in landfills?

Ans: In modern landfills, solid waste is layered with soil, compacted daily, and kept separate from groundwater. These procedures limit the growth of aerobic bacteria, which need air and water to decompose the solid wastes.

Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard
55. How does a surfactant work in paper recycling?

Ans: The ink on some papers, for example laser printer ink, is heavy and sinks to the bottom of the recycled paper slurry. A surfactant is a substance with molecules shaped to bind to the ink particles at one end and air bubbles at the other. The end result is that the surfactant lifts the ink particles to the surface where it can be skimmed off, leaving clean paper fibers to reuse.

Difficulty Level: Hard

56. Compare the environmental accomplishments of the Montreal protocols with the Kyoto accord.

Ans: The Kyoto accord (1995) was produced at an international meeting of scientists. At this meeting, the attendees endorsed an agreement for all countries to limit their emission of carbon dioxide. The United States did not sign this agreement. The Montreal Protocols (1986) resulted in a treaty that phased out the production of CFCs, which were harmful to the ozone layer. Since that treaty has been in effect, the ozone layer has gradually improved and is expected to be back to normal in a few decades.

Difficulty Level: Hard

57. Ozone at ground level and stratospheric ozone get different reactions from policy makers. Why?

Ans: Stratospheric ozone is necessary to shield humans from the deleterious effects of ultraviolet rays of the sun. At ground level, however, ozone is a caustic, stinging gas that can cause extensive damage to the human respiratory system. Ground level ozone also is a constituent of air pollution.

Difficulty Level: Hard

58. What causes the up and down “wiggles” in the graph of carbon dioxide concentrations in the atmosphere shown in Figure 19-8?

Ans: The carbon dioxide oscillations are caused by seasonal changes. Each spring, carbon dioxide is taken up by new plant growth; each fall, carbon dioxide is released again into the atmosphere. The overall trend is upward, documenting a gradual increase in carbon dioxide.

Difficulty Level: Hard
Chapter 19

59. How can states with automobile air pollution problems deal with the problem of air pollution?

Ans: California is an example of what states can legislate to decrease automobile air pollution. The solutions include tax incentives and research monies for hybrid cars; strict emission standards; and high gasoline taxes. Other ideas tried have been public transportation; marketing carpool advantages; and designating High Occupant Vehicle lanes on busy highways.
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard

60. Compare the largest ecosystem with the smallest ecosystem you can imagine. Give examples of how the parts within each system are interrelated and how energy is processed.

Ans: Answers will vary but both have the same parts, all need energy from the sun (directly or indirectly), all exchange energy, all have heat as a waste product, each successive trophic level requires more energy.
Link To: Ecology and Ecosystems
Difficulty Level: Hard

61. Trace the past history of a carbon molecule in your breath from 4.5 billion years ago to a “Whew!” during this set of questions.

Ans: Formed in the supernovae creation of the solar system; incorporated as CO2 with outgassing in atmosphere; caught up on photosynthesis; cycles through living biota plant-animal-gasses, eventually eat it and respiration occurs.
Link To: Ecology and Ecosystems
Difficulty Level: Hard

62. Describe the special problem of newspaper disposal. Why some communities will pay to have newspapers recycled rather than be paid for the raw materials old newspapers provide.

Ans: Newspaper does not degrade unless there is water and bacteria to help recycle it. Volume wise there is too much to actually recycle in a dump. To have them recycled means that trees are not being cut down for that particular set of paper.
Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard
63. What are the flaws in the assumptions at the base of current global circulation models? How do these flaws fuel the controversy about global warming?

Ans: These models, which break the atmosphere into unrealistic uniform chunks several hundred kilometers on a side, are at best imperfect ways of predicting changes in climate. For example, such a coarse-grained look at the atmosphere cannot possibly hope to deal with effects of clouds that typically are only a few miles on a side. Since the model breaks down, critics choose to ignore the parts that are predictive.

Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard

64. The elements CHNOPS are vital to living organisms. Select one and trace the path of it through various trophic levels and ecosystems.

Ans: Answers will vary but the element should be traced through at least three trophic levels and two ecosystems.

Link To: Ecology and Ecosystems
Difficulty Level: Hard

65. Compare and contrast the energy transmission and biomagnification of chemicals from trophic level to trophic level.

Ans: Although energy is lost from level to level, chemicals are magnified or concentrated from level to level. An example is DDT used to kill insects that eventually gets into birds making their eggs fragile and affecting reproduction of healthy young.

Link To: Ecology and Ecosystems
Difficulty Level: Hard

66. Research media, perhaps via Internet, for stories that illustrate the law of unintended consequences. Before the event was there any knowledge to suggest that the activity would have unintended consequences? Where there any social or political influences that pulled or pushed the decision? Is there any ‘fix’ after the events? Explain.

Ans: Answers will vary but the goal is to illustrate the principle and to demonstrate the decisions are not always based strictly on science but perhaps politics and community values.

Link To: The Law of Unintended Consequences
Difficulty Level: Hard
67. Explain how ozone can be both good and bad for the ecology of the planet and especially humans living on the surface.

Ans: Good ozone exists in the stratosphere many miles above our heads. Here it absorbs ultraviolet light and keeps it from reaching the ground. Bad ozone is about 5 feet off the ground where we are and inhibits the intake of oxygen causing respiratory distress.

Link To: Threats to the Global Ecosystem and Environment
Difficulty Level: Hard