

CHAPTER 20--WATER POLLUTION

Student: _____

1. Lake Washington, near Seattle, was degraded by the growth of which of the following?
 - A. coliform bacteria
 - B. protozoans
 - C. snails
 - D. aquatic plants
 - E. cyanobacteria
2. The degradation of Lake Washington resulted from the introduction by sewage treatment plants of which of the following?
 - A. phosphorus
 - B. nitrogen
 - C. oxygen
 - D. chlorine
 - E. fecal material
3. When researchers studying Lake Washington got no action from treatment plant managers, they did which of the following?
 - A. went on to something new
 - B. went to the Washington State legislature for help
 - C. went to the EPA for help
 - D. educated the public
 - E. wrote more scientific articles
4. Which of the following is by far the leading cause of water pollution?
 - A. mining
 - B. factories
 - C. sewage treatment plants
 - D. agriculture activities
 - E. ocean-going shipping
5. The World Health Organization (WHO) estimates how many people on earth do not have access to clean drinking water?
 - A. 1 out of 100
 - B. 1 out of 50
 - C. 1 out of 20
 - D. 1 out of 10
 - E. 1 out of 7

6. Of the following organisms, the group that is *least* likely to cause disease is
- A. bacteria
 - B. protozoa
 - C. algae
 - D. parasitic worms
 - E. viruses
7. A good indicator of water quality is the number of
- A. ducks
 - B. fish
 - C. turtles
 - D. coliform bacteria
 - E. protozoa
8. To be considered safe for drinking, a 100 milliliter sample of water should contain ____ colonies of coliform bacteria.
- A. 0
 - B. 5
 - C. 10
 - D. 100
 - E. 200
9. To be considered safe for swimming, a 100 milliliter sample of water should contain ____ or fewer colonies of coliform bacteria.
- A. 0
 - B. 5
 - C. 10
 - D. 100
 - E. 200
10. A body of water can be depleted of its oxygen by
- A. viruses and parasitic worms
 - B. organic wastes
 - C. sediments and suspended matter
 - D. organic compounds such as oil, plastics, solvents, and detergents
 - E. inorganic wastes
11. Which of the following is a point source of water pollution?
- A. offshore oil wells
 - B. livestock feedlots
 - C. urban lands
 - D. croplands
 - E. parking lots

12. Which of the following is a nonpoint source of water pollution?
- A. a sewage treatment plant
 - B. an electric power plant
 - C. an active or inactive coal mine
 - D. a logged forest
 - E. a factory
13. Oxygen sag curves occur when
- A. water levels are high
 - B. bacteria break down biodegradable wastes
 - C. when water flows quickly
 - D. when water is cool or cold
 - E. salt and fresh water mix
14. In most developed countries, large fish kills and contamination of drinking water may be caused by all of the following *except*
- A. malfunctioning sewage treatment plants
 - B. accidental release of toxic industrial chemicals
 - C. deliberate release of toxic industrial chemicals
 - D. accidental release of predatory exotic species
 - E. pesticides and plant nutrients from agricultural sources
15. According to the Global Water Policy Project, most cities in developing countries discharge ____ of their untreated sewage directly into rivers, streams, and lakes whose waters are then used for human consumption.
- A. 10-20%
 - B. 20-30%
 - C. 40-50%
 - D. 50-60%
 - E. 80-90%
16. Which of the following statements about lakes is *true*?
- A. Stratified layers of lakes are characterized by vertical mixing.
 - B. Stratification increases levels of dissolved oxygen, especially in the bottom layer.
 - C. Lakes are more vulnerable than streams to contamination by plant nutrients, and toxic substances
 - D. Lakes have more flushing than streams.
 - E. Changing of water in lakes takes days to weeks.

17. The natural nutrient enrichment of a shallow lake, estuary, or slow moving stream is called
- A. oligotrophy
 - B. spring/fall overturn
 - C. upwellings
 - D. red tides
 - E. eutrophication
18. In cultural eutrophication, fish die from
- A. acid deposition
 - B. decreasing solar energy used in photosynthesis
 - C. toxic substances in the water
 - D. increased sediment reducing habitats
 - E. loss of space
19. Which of the following is *not* a preventative method of reducing cultural eutrophication?
- A. banning the use of phosphate detergents
 - B. stopping the runoff of fertilizer from agricultural fields
 - C. advanced waste treatment
 - D. harvesting excess weeds
 - E. soil conservation and land-use controls
20. All of the following are cleanup methods of controlling cultural eutrophication, *except*
- A. using advanced waste treatment
 - B. treating plant growth with herbicides
 - C. harvesting excess weeds
 - D. pumping air through reservoirs to avoid oxygen depletion
 - E. removing algae using algaecides
21. What percentage of the 100,000 medium to large lakes near major U.S. population centers have some degree of cultural eutrophication?
- A. three-fourths
 - B. five-eighths
 - C. one-half
 - D. one-third
 - E. one-quarter
22. Which of the following is a lesson we can learn from the story of Lake Washington near Seattle?
- A. citizen action combined with scientific research works
 - B. reversing severe water pollution takes a long time
 - C. dumping wastewater treatment plants in the ocean is better than dumping in lakes
 - D. scientific research seldom gives the right answers
 - E. diluting wastewater with storm water runoff is a good idea

23. The Great Lakes possess ____% of all the surface fresh water in the United States.
- A. 35
 - B. 95
 - C. 75
 - D. 55
 - E. 45
24. Less than ____% of the water entering the Great Lakes leaves the St. Lawrence River.
- A. 1
 - B. 8
 - C. 16
 - D. 32
 - E. 64
25. How long does it take for pollutants to be flushed out of the Great Lakes into the ocean?
- A. 5 years
 - B. 20 years
 - C. 50 years
 - D. 100 years
 - E. 1000 years
26. One fish in ____ taken from the Great Lakes is unsafe for human consumption.
- A. ten
 - B. seven
 - C. five
 - D. four
 - E. three
27. The 2007 State of the Great Lakes report found all of the following problems still exist in the lakes, *except*
- A. Native carnivorous fish are declining in most of the lakes.
 - B. There is continuing wetland loss and degradation of habitats.
 - C. New pollutants in the lakes including pharmaceuticals.
 - D. Populations of native species at the base of the food chain are declining.
 - E. Dissolved oxygen levels continue to decline.
28. Drinking water for about ____ of the U.S. population and ____ of the rural populations comes from groundwater.
- A. 50%; 50%
 - B. 50%; 95%
 - C. 10%; 50%
 - D. 10%; 95%
 - E. 75%; 75%

29. Contaminated groundwater can not cleanse itself for all of the following reasons, *except*
- A. Groundwater does not move at all.
 - B. Contaminants are not dispersed effectively.
 - C. Lower concentrations of dissolved oxygen exist for decomposition.
 - D. Usually cold temperatures slow down reactions.
 - E. Contaminants are not diluted easily.
30. Over the 21st century, scientists expect to find many millions of ____ to become a major global health problem.
- A. people
 - B. carcinogens
 - C. solar panels
 - D. leaking underground storage tanks
 - E. leaking solid waste landfills
31. More than 140 million people, living in 70 countries worldwide, are drinking water that has arsenic concentrations of ____ times the accepted level.
- A. 2-10
 - B. 2-20
 - C. 3-50
 - D. 5-100
 - E. 10-1000
32. The only effective way to protect groundwater is to
- A. prevent contamination
 - B. use monitoring wells
 - C. cover all wells carefully
 - D. treat all water from underground sources
 - E. use advanced sewage treatment
33. Which of the following is *not* a means of purifying water for drinking?
- A. protecting watersheds from pollution
 - B. exposing water in a clear plastic bottle to intense sunlight
 - C. LifeStraws
 - D. PUR
 - E. centrifugation

34. Bottled water in the U.S. costs 240 to 100,000 times more than tap water, yet ____ of bottled water is contaminated by synthetic organic chemicals and bacteria.
- A. one-tenth
 - B. one-fifth
 - C. one-third
 - D. one-half
 - E. three-quarters
35. What percentage of expensive bottled water is actually bottled tap water?
- A. 5%
 - B. 10%
 - C. 20%
 - D. 30%
 - E. 40%
36. What percentage of the people using coastal beaches in the United States developed ear infections, sore throats, eye irritations, respiratory disease, or gastrointestinal disease from swimming in seawater contaminated by infectious viruses and bacteria?
- A. 5%
 - B. 10%
 - C. 20%
 - D. 40%
 - E. 80%
37. Agricultural and sewage runoffs cause harmful algal blooms, with the algal blooms causing all of the following *except*
- A. release waterborne and airborne toxins
 - B. poison seafood
 - C. decrease agricultural yields
 - D. kill some fish-eating birds
 - E. reduce tourism
38. ____ of the world's population lives on or near the coast.
- A. 20%
 - B. 30%
 - C. 40%
 - D. 50%
 - E. 60%

39. The world's third-largest dead zone is found in the Gulf of Mexico and is caused by agricultural runoff carried by
- A. the Cuyahoga river
 - B. the Amazon river
 - C. the Mississippi river
 - D. the Colorado river
 - E. the Rio Grande river
40. The majority of the oil pollution of the ocean comes from
- A. blowouts (rupture of a borehole of an oil rig in the ocean)
 - B. tanker accidents
 - C. environmental terrorism
 - D. runoff from land
 - E. normal operation of offshore wells
41. The *most* common problem encountered by seabirds coated with oil is
- A. immediate death
 - B. vulnerability to predators
 - C. loss of buoyancy and insulation, causing deaths from exposure
 - D. poisoning by taking in the oil internally
 - E. starvation
42. The oil company responsible for the oil spill of the *Valdez* was
- A. Alaska
 - B. Gulf
 - C. Exxon
 - D. Sunoco
 - E. Texaco
43. Farmers can reduce agricultural runoff by all of the following, *except*
- A. using slow-release fertilizers
 - B. keeping cropland covered with vegetation
 - C. planting buffer zones between cultivated lands and water
 - D. using no fertilizer on steeply sloped land
 - E. switching from row crops to animal feedlots
44. About ____ of U.S. lakes were tested unsafe for fishing, swimming, and other recreational uses.
- A. 25%
 - B. 45%
 - C. 65%
 - D. 75%
 - E. 85%

45. The Clean Water Act could be strengthened by all of the following strategies, *except*
- A. prevention and control of toxic water pollution
 - B. more funding for integrated airshed and watershed planning
 - C. allowing citizens to bring lawsuits to ensure that water pollution laws are enforced
 - D. establishing national effluent standards
 - E. requiring states to do a better job of monitoring and enforcing water pollution laws
46. The 1972 Clean Water Act has accomplished all of the following between 1972 and 2002, *except*
- A. annual wetland losses decreased by 80%
 - B. US population served by sewage treatment plants increased from 32% to 74%
 - C. US streams are no longer polluted by runoff from animal wastes
 - D. Americans served by water systems meeting standards goes from 79% to 94%
 - E. US streams that are fishable and swimmable goes from 46% to 60%
47. In a septic tank system, which of the following is *not* true?
- A. Wastewater is pumped into a settling tank.
 - B. Grease and oil rise to the top in the tank.
 - C. Solids are decomposed by bacteria.
 - D. Bacteria-treated waste is discharged in an absorption field.
 - E. After leaving the absorption field, wastewater is cleaned and can be used again for human consumption.
48. Which of the following types of sewage treatment are properly matched?
- A. primary-biological process
 - B. secondary-mechanical process
 - C. advanced-physical and chemical processes
 - D. secondary-chemical process
 - E. primary-chemical process
49. On a larger scale, waterless, odorless composting toilet systems have all of the following advantages, *except*
- A. converts human fecal material to soil-like fertilizer supplement
 - B. removes toxic and hazardous chemicals
 - C. saves large amounts of water
 - D. decreases energy used to pump and purify water
 - E. cheaper to install and maintain

50. The individual matters in terms of what can be done to help reduce water pollution. All of the following are things we can do, *except*
- A. Fertilize gardens and lawns with manure or compost instead of fertilizers.
 - B. Minimize use of pesticides.
 - C. Prevent yard wastes from entering storm drains
 - D. Do not flush unwanted medicines down the toilet.
 - E. Buy commercially produced foods.
51. One of the primary lessons that can be learned from the Core Case Study about Lake Washington is that citizen pressure on elected officials works.
- True False
52. As a result of efforts of researchers and the public, the waste water formerly released into Lake Washington was diverted into nearby rivers.
- True False
53. Agricultural activities are by far the leading cause of water pollution.
- True False
54. Excessive heat is considered a form of water pollution.
- True False
55. Parking lots are a major source of point source pollution for rivers and lakes.
- True False
56. Climate change contributes to water pollution in some areas by altering the levels of precipitation.
- True False
57. WHO estimates that 3.2 million people³/₄most of them children³/₄die every year from inadequate clean water or from infectious diseases they get from contaminated drinking water.
- True False
58. The Mississippi river was photographed in 1969 burning while flowing through a city.
- True False
59. Stream pollution from industry and untreated sewage is a growing problem in developing countries.
- True False

60. The polluted condition of the Ganges River, holy to Hindus, will get worse because the majority of the water comes from a glacier that is rapidly melting.
- True False
61. Eutrophication is a condition in an aquatic ecosystem where high nutrient concentrations stimulate blooms of algae.
- True False
62. Eutrophic lakes have murky, highly productive waters located closest to the wetland status in which many clear-water species cannot survive.
- True False
63. Eutrophication can be reversed if nutrient inputs are sharply reduced, but it takes a relatively long time to reverse the damage.
- True False
64. Because of improved efforts at pollution prevention, the U.S. EPA lists only a handful of large lakes near major cities as having some degree of cultural eutrophication.
- True False
65. The invasion by zebra mussels into The Great Lakes is an example of pollution.
- True False
66. Cold temperatures of groundwater slow down the chemical reactions that decompose wastes.
- True False
67. The potentially fatal condition known as “blue baby syndrome” in infants under 6 months old can result from agricultural pollution in drinking water.
- True False
68. Arsenic in the drinking water is not a concern in the United States.
- True False
69. The EPA has cleaned up 350,000 underground tanks in the United States that were leaking gasoline, diesel fuel, home heating oil, or toxic solvents.
- True False

70. The technology to convert sewer water into pure drinking water is inexpensive and faces little opposition.
- True False
71. Placing contaminated water in a clear plastic bottle and exposing it to the sun can kill infectious microbes in as little as three hours.
- True False
72. According to the World Health Organization and other scientists, the 10 ppb standard level for arsenic levels in drinking water is safe and perhaps even too cautious.
- True False
73. Though it would be cheaper and as effective to protect watersheds around water sources rather than building treatment facilities, no major city has made the attempt to do so.
- True False
74. Developing countries dump the majority of their untreated sewage directly into freshwater ecosystems.
- True False
75. The Exxon *Valdez* oil spill best illustrates point source water pollution.
- True False
76. Scientists fear the dead zone in the Gulf of Mexico could reach a tipping point beyond which the ecosystem could collapse.
- True False
77. A recent report indicates 80-90% of the municipal sewage from most coastal developing countries, and some developed countries, is dumped untreated into the oceans.
- True False
78. Each year, because of harmful algal blooms, 200 or more oxygen depleted zones form in coastal regions around the world.
- True False
79. Oil leaks into the world's oceans from industry and cities have dropped by almost 90%.
- True False

80. Exxon Mobil, responsible for the Exxon Valdez oil spill, recovered most of the costs of fines and clean up from tax credits and insurance payments.
- True False
81. Following the Exxon *Valdez* oil spill, all 10,000 of the world's oil tankers now have double hulls.
- True False
82. More than seven million people in the United States get sick from swimming in waters contaminated by sewage overflows and storm-water runoff.
- True False
83. The end product of living machines is a soil-like material called "humus," which legally must be either buried or removed by a licensed seepage hauler.
- True False
84. About 45% of the largest water polluters in the U.S. have declared the Clean Water Act no longer applies to water they are polluting.
- True False
85. Cyanobacteria are commonly called _____.
- _____
86. When Lake Washington became cloudy from the growth of blue-green algae, the culprit was discovered to be _____ from the area's sewage plants.
- _____
87. _____ are dilute sources of pollution that are difficult and expensive to diagnose and even more difficult to control.
- _____
88. _____ is any change in water quality that can harm living organisms or make the water unfit for human uses.
- _____
89. One new form of water pollution is caused by the use of human-made materials such as _____, which make up millions of products, all of which eventually end up in the environment.
- _____

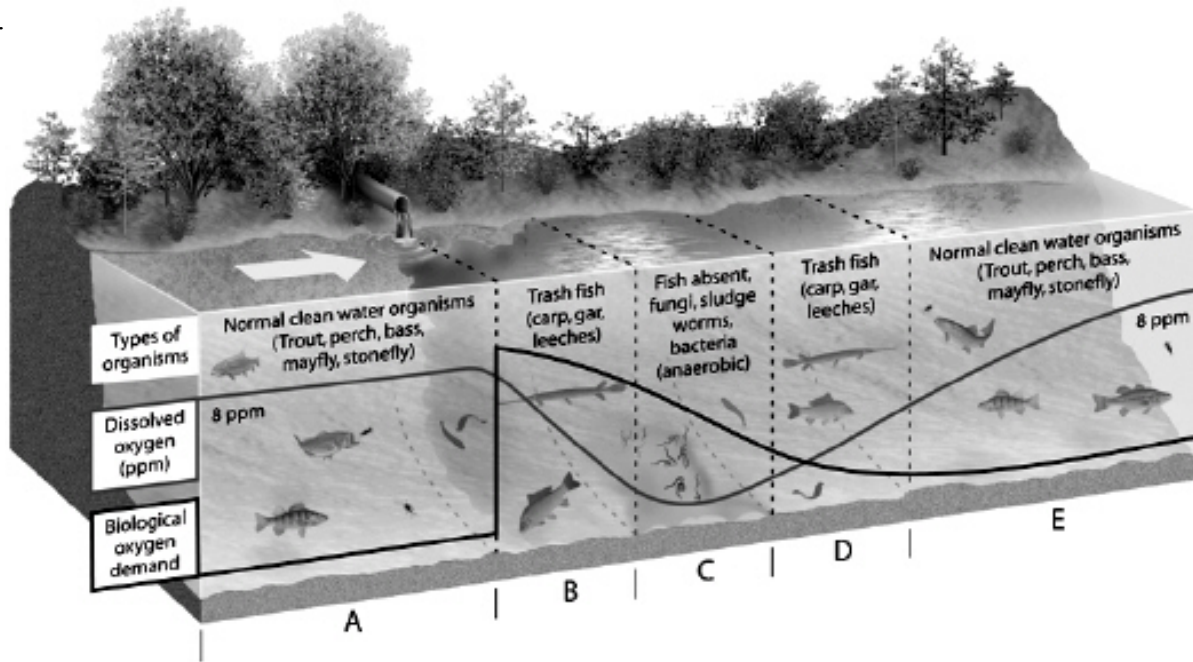
90. Worldwide, _____, caused mostly by exposure to polluted water, on average kills a young child every 18 seconds.
- _____
91. The leading cause of water pollution is _____ activities.
- _____
92. The breakdown of biodegradable wastes by bacteria depletes oxygen and may create an _____.
- _____
93. An important indicator of water quality is the level of _____, which changes due to the oxygen demand of breaking down biodegradable wastes.
- _____
94. Human activities can greatly accelerate _____ by increasing the rate at which nutrients and organic substances enter aquatic ecosystems from surrounding land.
- _____
95. In less-developed countries cities discharge _____ of their untreated sewage directly into rivers, streams and lakes whose waters are used for drinking, bathing, and washing clothes.
- _____
96. One-fifth of all the freshwater in the world is contained in the _____ of the United States.
- _____
97. Groundwater dispersing a pollutant creates a(n) _____, which, if it reaches a well, can get into drinking water.
- _____
98. Water is being bottled and shipped to the U.S. and Europe from the Pacific island of Fiji, yet _____ of the people of Fiji do not have access to safe drinking water.
- _____
99. The Clean Water Act of 1974 requires the EPA to establish national drinking water standards, called _____, for any harmful pollutants.
- _____

100. _____, which produce as much waste as a small city, often dump these wastes at sea, even though it is illegal in U.S. waters.

101. At least _____ % of the oil reaching the oceans is spilled, leaked, or dumped onto land or into sewers.

102. Oxygen depleted zones form around the world, occurring mostly in _____ waters and in landlocked seas.

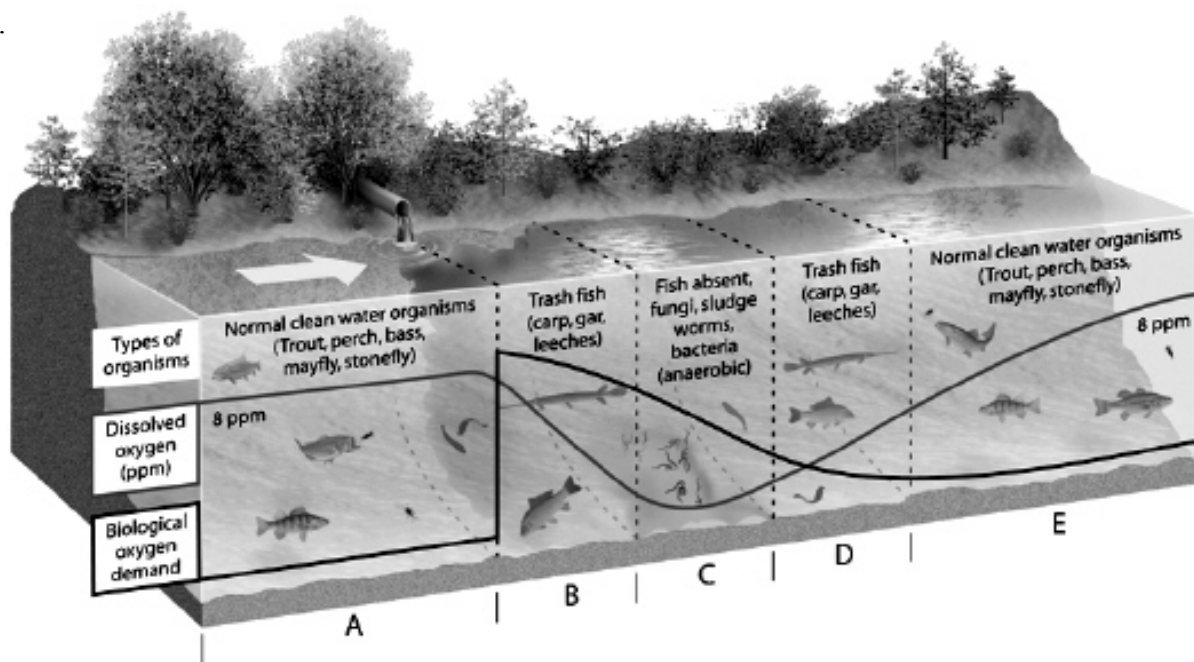
103. According to a 2007 government study, tens of thousands of _____ in 43 states are leaking



Dilution and Decay of Degradable Wastes

Use the Figure above to answer the following question(s).

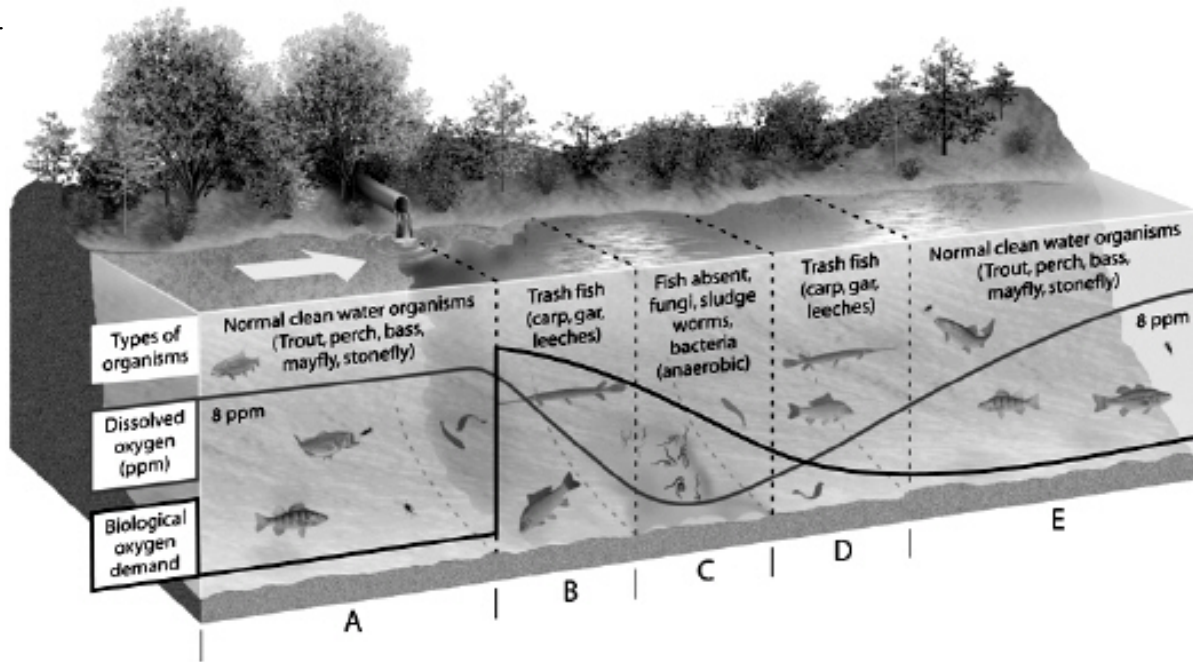
In which zone are organisms that require oxygen most likely going to be absent?



Dilution and Decay of Degradable Wastes

Use the Figure above to answer the following question(s).

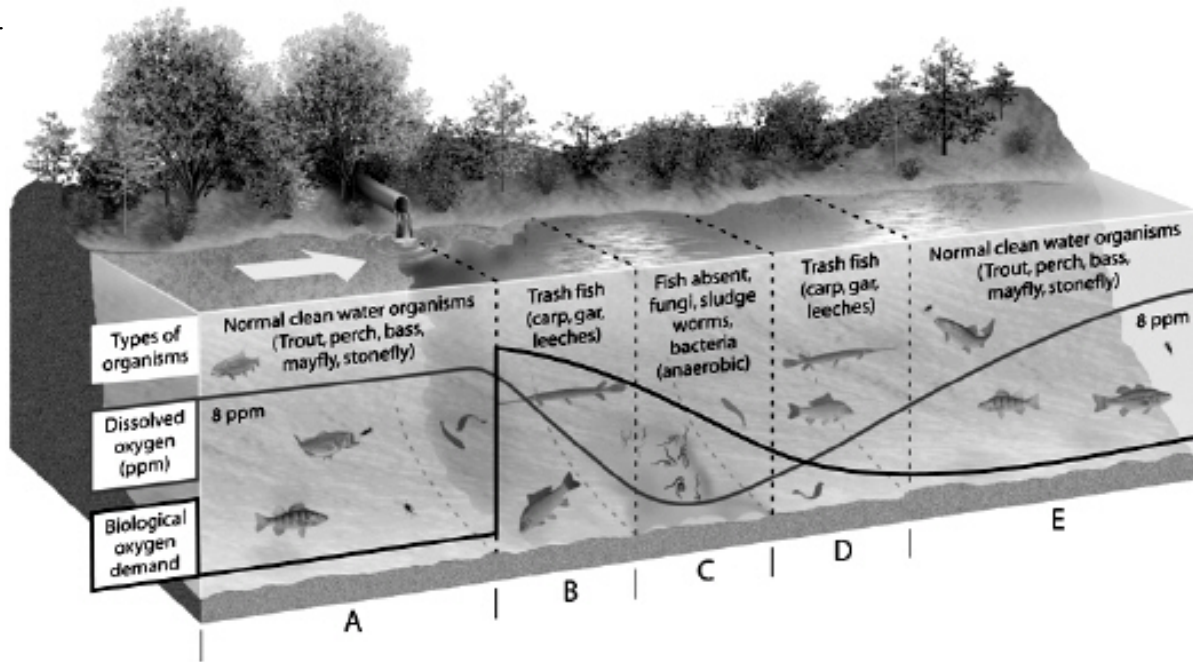
In which zone are wastes being decomposed and low-oxygen fishes are present?



Dilution and Decay of Degradable Wastes

Use the Figure above to answer the following question(s).

In which zone has the stream recovered, with a return of clean water organisms?

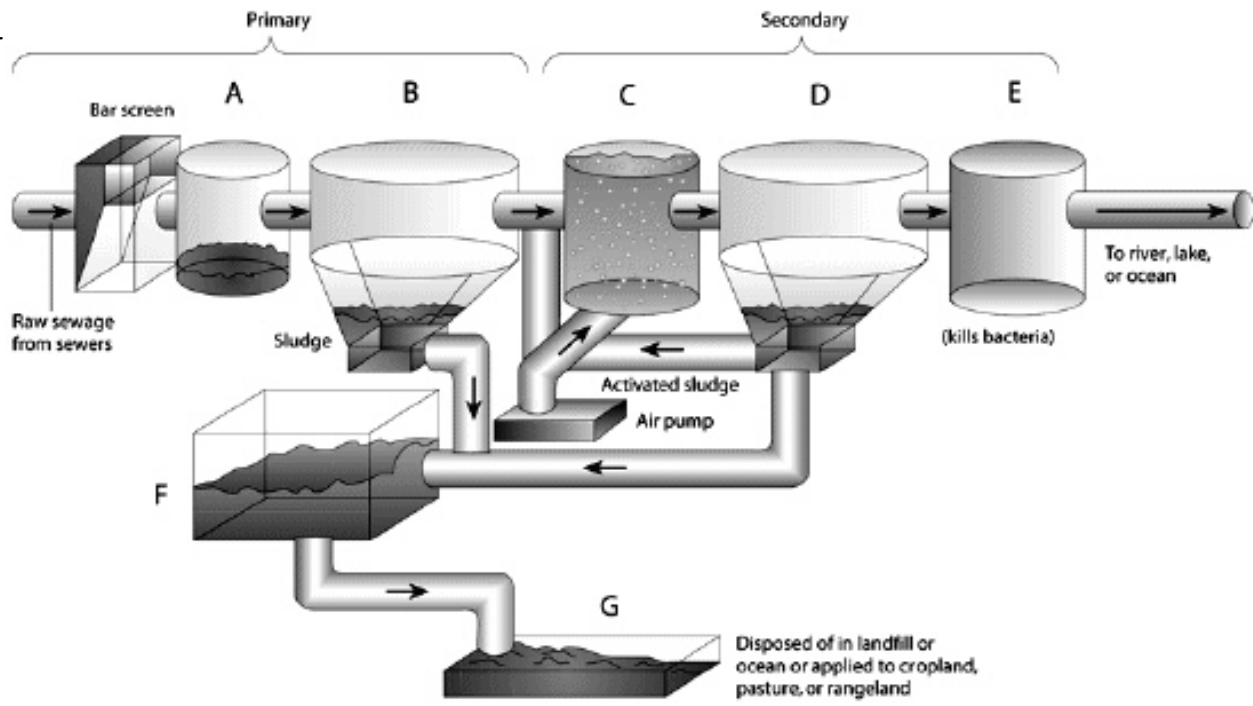


Dilution and Decay of Degradable Wastes

Use the Figure above to answer the following question(s).

In which zone has the stream begun to return a normal status following the oxygen sag?

108.

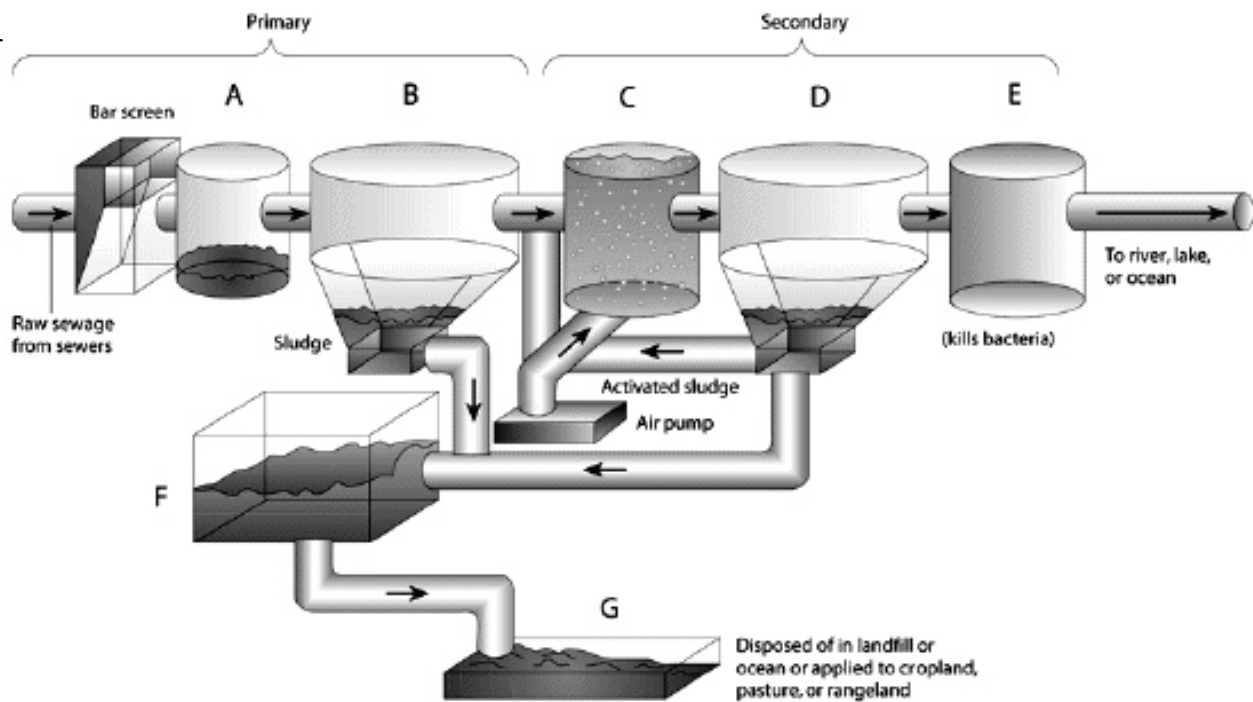


Primary and Secondary Sewage Treatment

Use the Figure above to answer the following question(s).

Choose the letter which indicates where bacteria are killed and water is ready to re-enter the environment.

109.

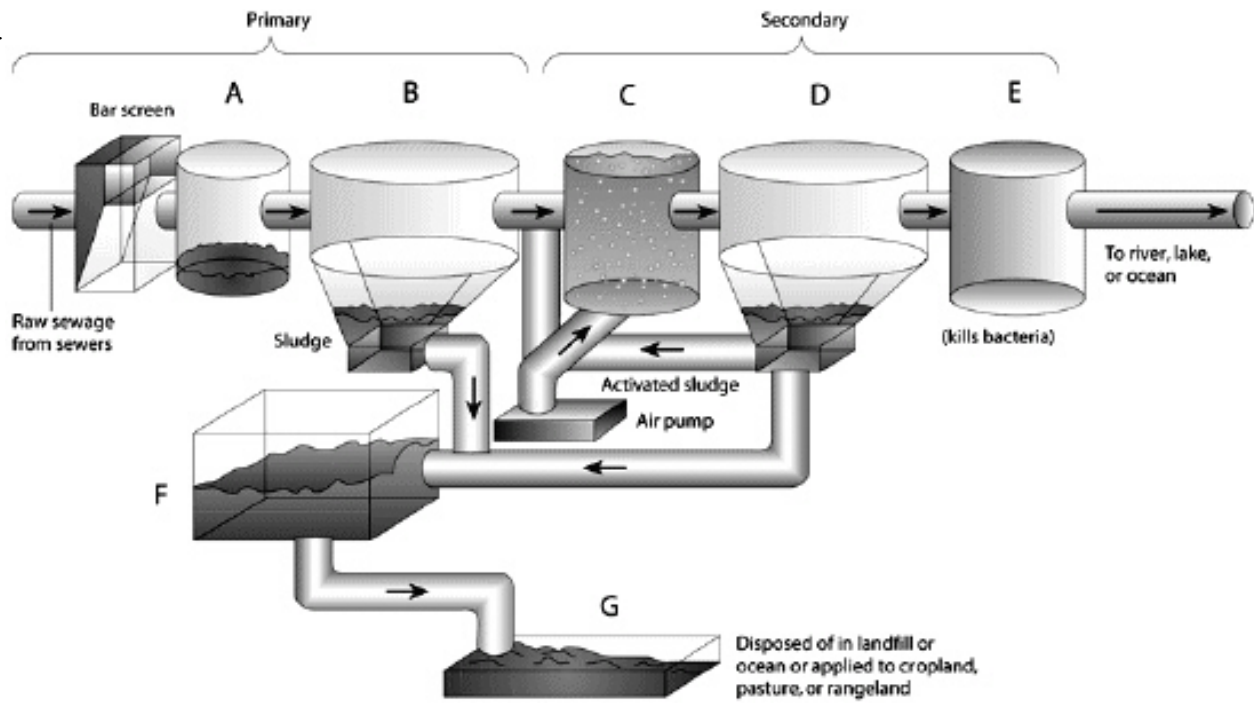


Primary and Secondary Sewage Treatment

Use the Figure above to answer the following question(s).

Choose the letter that represents where sludge is dried before being disposed of.

110.

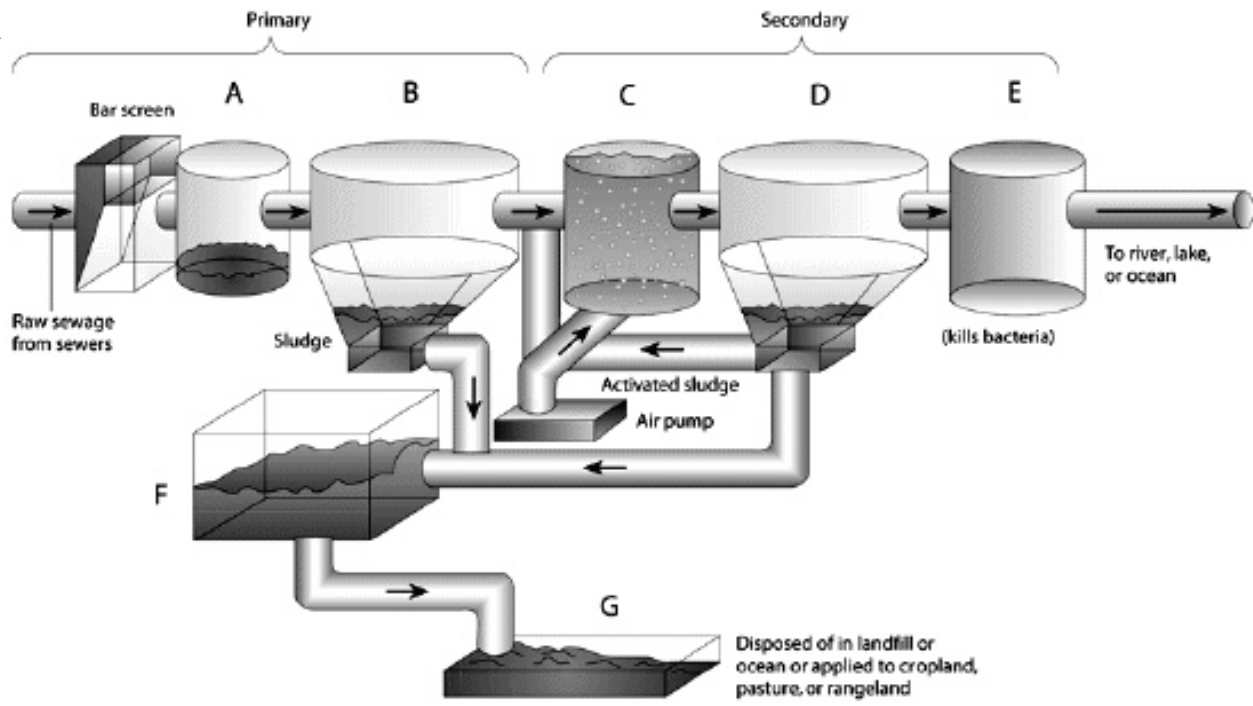


Primary and Secondary Sewage Treatment

Use the Figure above to answer the following question(s).

Choose the letter that represents where the water is aerated.

111.

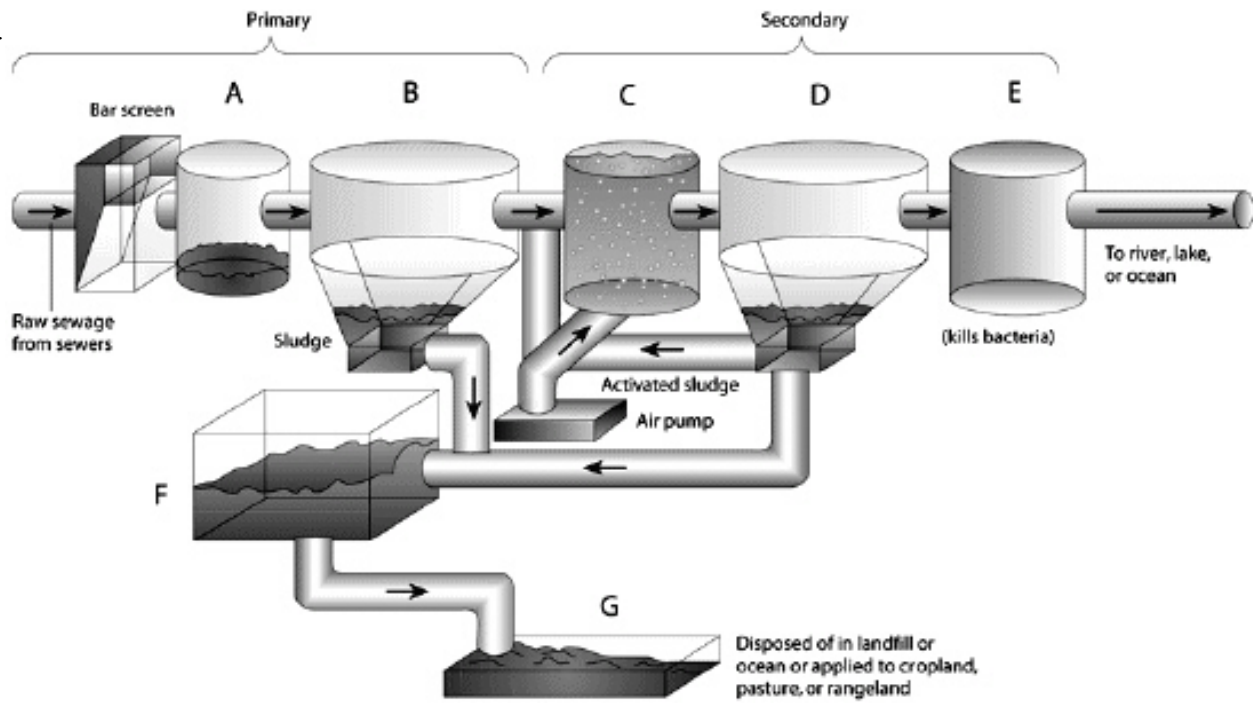


Primary and Secondary Sewage Treatment

Use the Figure above to answer the following question(s).

Choose the letter that represents where large floating objects and solids are removed.

112.

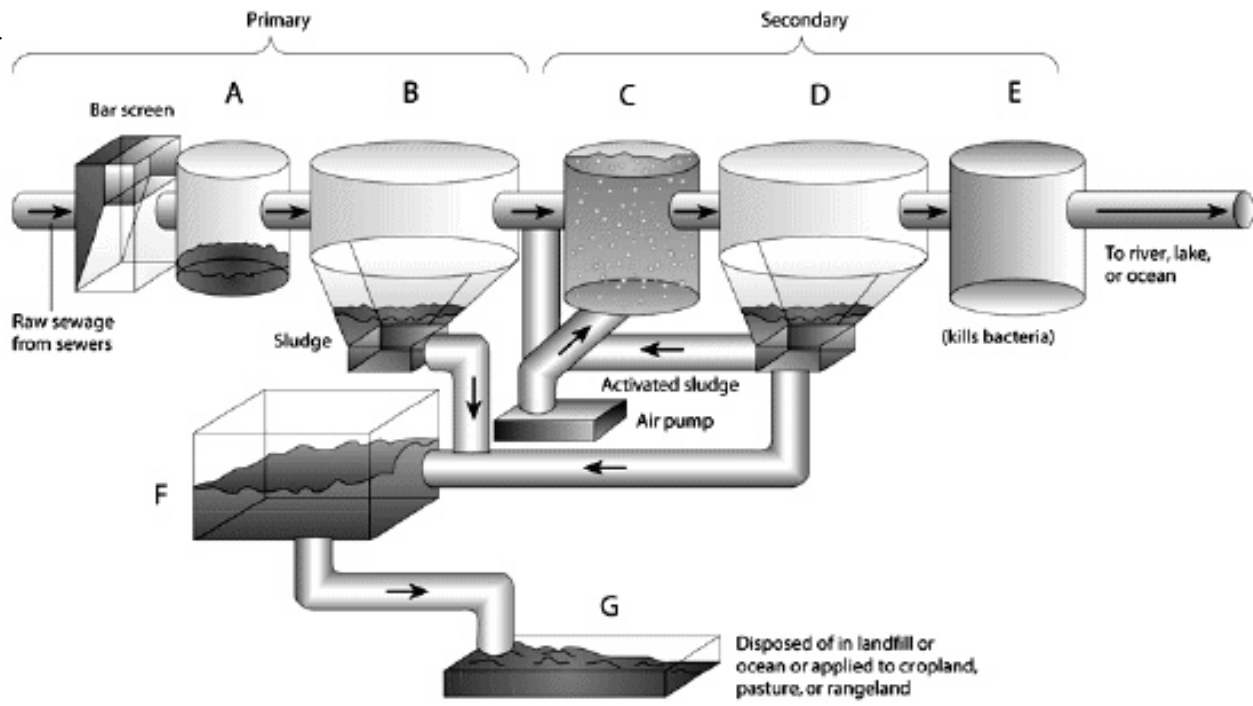


Primary and Secondary Sewage Treatment

Use the Figure above to answer the following question(s).

Choose the letter that represents where activated sludge settles out in the biological process of sewage treatment.

113.



Primary and Secondary Sewage Treatment

Use the Figure above to answer the following question(s).

Choose the letter that represents where suspended solids settle out as sludge in the physical process of sewage treatment.

114. The United Nations reports that each year unsafe water kills more people than all the wars and other forms of violence. Explain why unsafe water is such a major problem.

CHAPTER 20--WATER POLLUTION Key

1. E
2. A
3. D
4. D
5. E
6. C
7. D
8. A
9. E
10. B
11. A
12. D
13. B
14. D
15. E
16. C
17. E
18. B
19. D
20. A
21. D
22. A
23. B
24. A
25. D
26. D
27. E
28. B
29. A
30. D

- 31. D
- 32. A
- 33. E
- 34. C
- 35. E
- 36. D
- 37. C
- 38. C
- 39. C
- 40. D
- 41. C
- 42. C
- 43. E
- 44. B
- 45. D
- 46. C
- 47. E
- 48. C
- 49. B
- 50. E
- 51. TRUE
- 52. FALSE
- 53. TRUE
- 54. TRUE
- 55. FALSE
- 56. TRUE
- 57. TRUE
- 58. FALSE
- 59. TRUE
- 60. TRUE
- 61. TRUE
- 62. FALSE
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- 65. TRUE
- 66. TRUE
- 67. TRUE
- 68. FALSE
- 69. TRUE
- 70. FALSE
- 71. TRUE
- 72. FALSE
- 73. FALSE
- 74. TRUE
- 75. TRUE
- 76. TRUE
- 77. TRUE
- 78. TRUE
- 79. TRUE
- 80. TRUE
- 81. FALSE
- 82. TRUE
- 83. FALSE
- 84. TRUE
- 85. blue-green algae
- 86. phosphorus
- 87. Non-point sources
- 88. Water pollution
- 89. plastics
- 90. diarrhea
- 91. agricultural
- 92. oxygen sag curve
- 93. dissolved oxygen
- 94. eutrophication
- 95. 80-90%
- 96. Great Lakes
- 97. plume
- 98. one-half

99. maximum contaminant levels

100. cruise ships *or* cruise liners

101. 37

102. temperate coastal

103. gasoline storage tanks

104. C

105. B

106. E

107. D

108. E

109. G

110. C

111. A

112. D

113. B

114. (pages 532-533) Students may include one or more of the following:

1. poverty

2. human and animal wastes are often deposited or washed into water. These wastes may contain infectious disease organisms which are transmitted to humans who drink untreated water.

3. humans have considered streams, lakes, and oceans as convenient dumping grounds for sewage and other pollutants. The increasing human population makes this a dangerous concept, threatening the health of humans and the waters we pollute.

4. secondary and tertiary water treatment facilities are expensive to build and maintain, making them a luxury in many less-developed countries. Without these facilities the populations of these countries are vulnerable to the infectious agents.

5. the most vulnerable populations will be the weak, the aged, and children. Diarrhea is the most common killer of young children.