

Student: \_\_\_\_\_

1. Residence time for water in Lake Tahoe, Nevada/California is 600 years which means that
  - A. A water molecule entering the lake will remain in the lake for 600 years.
  - B. The total volume of water in Lake Tahoe remains constant for 600 years.
  - C. The water in Lake Tahoe will sustain aquatic life for 600 years.
  - D. Outflow from Lake Tahoe occurs once every 600 years.
2. Over time, dissolved magnesium concentration in a lake has reached equilibrium. Input is from streams draining into the lake; magnesium is removed by precipitation in lake sediments. If wastewater discharge upstream doubles the rate at which magnesium is delivered to the lake,
  - A. The BOD of the lake will double.
  - B. The BOD of the lake will be cut in half.
  - C. The residence time of magnesium in the lake will double.
  - D. The residence time of magnesium in the lake will be halved.
3. When human activities alter natural chemical cycles of elements, they most often do so by
  - A. Increasing the capacity of the system for an element.
  - B. Decreasing the capacity of the system for an element.
  - C. Increasing the rate of input of elements into the system.
  - D. Changing one chemical element into another.
4. A possible consequence of eutrophication is
  - A. Reduction of nutrient levels in a body of water.
  - B. Fish kills, because of the lowered dissolved oxygen in the water.
  - C. An increase in the biodiversity of the body of water.
  - D. Sequestration of dissolved toxins in lake sediments.
5. When the source of pollutant is readily identified by one location then the type of pollution is called
  - A. Point source.
  - B. Nonpoint source.
  - C. Leachate.
  - D. All the choices are correct.
6. Point sources of pollution include all of the following except
  - A. A septic tank leaking sewage.
  - B. Salt runoff from roads.
  - C. Wastewater from a factory.
  - D. Organic matter discharged from a meat-packing plant.
7. The gases produced as a byproduct of anaerobic decomposition include
  - A. Hydrogen sulfide and ethane.
  - B. Hydrogen sulfide and propane.
  - C. Hydrogen sulfide and butane.
  - D. Hydrogen sulfide and methane.
8. In water, the organic matter load is explained by the
  - A. Biological oxygen demand.
  - B. Biophysical oxygen demand.
  - C. Biometric oxygen demand.
  - D. Biochemical oxygen demand.

9. Groundwater pollution
  - A. Comes only from non-point pollution sources, like fertilizer runoff from farmland.
  - B. Is readily detectable because the presence of pollutants is obvious from the water's taste or smell.
  - C. Is very difficult to clean up once it has occurred.
  - D. All of the choices are correct.
10. Nitrate in groundwater can be increased by infiltration of runoff from all of the following except
  - A. Manure from cattle feedlots.
  - B. Fields treated with synthetic fertilizers containing nitrogen.
  - C. Sewage-treatment waste water.
  - D. Glacial melt.
11. Volumetrically, the largest non-point source of pollution in the United States is
  - A. Cropland.
  - B. Forested land.
  - C. Mine sites.
  - D. Urban storm water runoff.
12. The dose-response curve for arsenic
  - A. Shows no benefit to low concentrations and great harm from high concentrations.
  - B. Shows that arsenic is beneficial to humans when consumed in low quantities, but toxic at high quantities.
  - C. Was a major factor in setting the new, lower drinking-water standard for dissolved arsenic of 10 ppb in public water supplies.
  - D. Shows that microorganisms can be very helpful in decontaminating a site with high arsenic levels.
13. Mercury
  - A. Is most toxic to humans in the form of methyl mercury.
  - B. Is bio-concentrated (concentrations increase up the food chain), with the result that large fish like tuna . may contain unacceptable levels.
  - C. May be added to the atmosphere through the burning of coal, incineration of waste, smelting . association with ore processing and processing of batteries.
  - D. Is transferred from the atmosphere into water, where microorganisms transform it to methyl mercury.
  - E. All of the choices are correct.
14. Lead, mercury and plutonium are these that have a tendency to accumulate in organisms.
  - A. Radioactive metals
  - B. Precious metals
  - C. Native metals
  - D. Heavy metals
15. The toxicity of industrial pollutants may go unrecognized for all of the following reasons except
  - A. They often cause skin and eye irritation.
  - B. Their harmful effects may be slow to develop.
  - C. They may be harmful only in some concentrations or circumstances.
  - D. They cannot be tested for safety on all organisms.
16. Thermal pollution differs from most chemical pollution in that
  - A. Despite being called "pollution", it causes no real harm.
  - B. It is localized in impact and short-lived.
  - C. It has by now effectively been eliminated as an environmental hazard.
  - D. All of the choices are correct.

17. In an agricultural region,
- A Spring planting and application of fertilizers and herbicides can result in concentration spikes of these chemicals in rivers, due to spring rains.
  - B. Crops generally use the fertilizer applied to enhance their growth very efficiently.
  - C. Herbicides and pesticides are retained in the soil and do not present a water-pollution threat.
  - D The use of filter strips in riparian zones (areas adjacent to streams) has not been demonstrated to be effective in reducing nutrient loading of streams.
18. Improper agricultural techniques increase erosion rates nine times higher than normal resulting in
- A. Sediment erosion.
  - B. Sediment pollution.
  - C. Sediment aggregation.
  - D. Sediment increase.
19. A lake may be described as "dead" when its condition is
- A. Eutrophic.
  - B. Aerobic.
  - C. Anaerobic.
  - D. Saline.
20. Breakdown of organic matter in the absence of oxygen is this type of decay.
- A. Aerobic
  - B. Anaerobic
  - C. Biochemical
  - D. Eutrophic
21. Biochemical oxygen demand is the amount of oxygen needed
- A. By humans to breathe.
  - B. By all organisms in a system, both plants and animals.
  - C. For aerobic breakdown of organic matter in a system.
  - D. To destroy all chemical pollutants in a system.
22. Dumping lawn clippings into a stream will reduce this
- A. Flow rate.
  - B. Dissolved oxygen.
  - C. Dissolved nitrogen.
  - D. Biochemical oxygen demand.
23. Water containing an abundance of nutrients, which encourages lush growth of such plants as algae is termed
- A. Eutrophic.
  - B. Aerobic.
  - C. Biochemical.
  - D. Accumulative.
24. Eutrophication of water is accelerated by
- A. Increased sediment load from erosion.
  - B. Addition of oxygen.
  - C. Reduction in phosphate input.
  - D. Reduction in nitrate input.
25. What develops as a result of migration of the pollutant by groundwater that forms down-gradient with reference to the point source
- A. Contaminant dome.
  - B. Contaminant deposit.
  - C. Contaminant basin.
  - D. Contaminant plume.

26. Groundwater pollution in situ is commonly handled by
- Waiting for the pollutants to disperse or break down.
  - Chemical decontamination to remove the pollutants.
  - Aeration to restore oxygen levels.
  - All of the choices are correct.
27. Ground water contaminated with acid rain percolates through a limestone aquifer. With longer residence time in the aquifer system,
- Dissolved sulfate in the water will increase.
  - Dissolved nitrate in the water will increase.
  - Dissolved bicarbonate in the water will increase.
  - All of the choices are correct.
28. Dredging of a lake bottom
- May be done to remove toxic pollutants attached to sediment particles.
  - Can cause sediment pollution.
  - May reduce nutrient recycling from sediments.
  - All of the choices are correct.
29. The escape of nutrients from sediments can be reduced or eliminated by any of the following strategies except
- Dredging.
  - Aeration.
  - Chemical treatment of the sediment.
  - Emplacement of a plastic or impermeable clay barrier over the bottom sediments.
30. Pump and treat technique is used for reversing the damage for
- Streams.
  - Lakes.
  - Groundwater.
  - Estuaries.
31. Which of the following statements is not true?
- Chemical treatment of sediment can be effective in reducing pollution problems, but it must be repeated every few years
  - Fast-flowing streams are generally better aerated than are lakes
  - A body of water is described as "dead" when it contains fatal concentrations of toxic chemicals
  - An oxygen sag curve describes changes in a stream's dissolved oxygen content along its length below an organic-matter source
32. Use of microorganisms to break down toxic organic compounds in ground water is called
- Bioremediation.
  - Aerobic decay.
  - Anaerobic decay.
  - Eutrophication.
33. The pump-and-treat method is
- The surface treatment of polluted groundwater that has been removed from an aquifer.
  - The process by which municipal sewage is treated before discharge into a river.
  - Ineffective in cleansing contaminated water well enough to be used as a drinking water supply.
  - A fast, effective and inexpensive means of treating contaminated groundwater.
34. Given the quantitative definition of residence time, the effect of increasing the rate of input of a chemical into a natural system at equilibrium would be to increase the chemical's residence time.  
True   False
35. Naturally occurring concentrations of some toxic elements, such as arsenic, may exceed both recommended "safe" levels and wastewater standards for industry.  
True   False

36. The threat posed by some synthetic chemicals is difficult to assess because of lack of knowledge of their residence times in natural systems.  
True False
37. A factory illegally dumps arsenic-rich wastewater into a lake, where the residence time of the arsenic is 10 years. If the dumping stops, after 30 years, the amount of arsenic in the lake will be one-third what it was when the dumping was stopped.  
True False
38. Nonpoint pollution sources are more diffuse and thus harder to monitor and control than are most point sources.  
True False
39. Because groundwater flow rates are often slow, groundwater pollution may first be detected many years after the occurrence of contamination and in areas distant from the pollution source.  
True False
40. Concern about environmental pollution is such that comprehensive health hazard information has now been determined for most synthetic drugs and agricultural and industrial chemicals.  
True False
41. Heavy metals accumulate in organisms, increasing in their amount up a food chain because they are concentrated in larger and larger organisms.  
True False
42. Mercury is so toxic in all its forms that it is no longer used except as a poison, as in fungicides.  
True False
43. Eutrophication does not occur naturally; it is the result of human activities altering the nutrient balance in water.  
True False
44. Eutrophication caused by excess runoff of nitrate and phosphate fertilizer from farmland could be avoided by substitution of natural, organic fertilizers, like manures, for synthetic fertilizers.  
True False
45. An oxygen sag curve describes how oxygen in a body of water is consumed by organisms, such as fish.  
True False
46. Use of settling ponds below farm fields reduces sediment pollution of surface runoff water.  
True False
47. After the dangers of DDT were recognized, use of toxic organic chemicals in agriculture was virtually eliminated in the United States.  
True False
48. Pollution of surface water has nothing to do with pollution of groundwater.  
True False
49. Groundwater pollution can be reduced by introduction of microorganisms that may break down some of the wastes.  
True False
50. Chemical decontamination is principally used for small toxic-waste spills in surface waters.  
True False
51. Discharge of effluent from a water treatment plant into a stream increases the BOD of the water.  
True False

52. If ground water is contaminated with petroleum products, pumping from a level close to the water table may selectively extract much of the pollution.  
True False
53. Groundwater pollution is most often and most effectively treated in situ, which minimizes the risk of spreading the pollution.  
True False
54. Chemical surveys by aircraft can help identify sites of particularly high probability of toxic-element contamination, such as areas affected by acid mine drainage.  
True False

## 17 Key

1. Residence time for water in Lake Tahoe, Nevada/California is 600 years which means that  
**A.** A water molecule entering the lake will remain in the lake for 600 years.  
B. The total volume of water in Lake Tahoe remains constant for 600 years.  
C. The water in Lake Tahoe will sustain aquatic life for 600 years.  
D. Outflow from Lake Tahoe occurs once every 600 years.

Montgomery - Chapter 17 #1

2. Over time, dissolved magnesium concentration in a lake has reached equilibrium. Input is from streams draining into the lake; magnesium is removed by precipitation in lake sediments. If wastewater discharge upstream doubles the rate at which magnesium is delivered to the lake,  
A. The BOD of the lake will double.  
B. The BOD of the lake will be cut in half.  
C. The residence time of magnesium in the lake will double.  
**D.** The residence time of magnesium in the lake will be halved.

Montgomery - Chapter 17 #2

3. When human activities alter natural chemical cycles of elements, they most often do so by  
A. Increasing the capacity of the system for an element.  
B. Decreasing the capacity of the system for an element.  
**C.** Increasing the rate of input of elements into the system.  
D. Changing one chemical element into another.

Montgomery - Chapter 17 #3

4. A possible consequence of eutrophication is  
A. Reduction of nutrient levels in a body of water.  
**B.** Fish kills, because of the lowered dissolved oxygen in the water.  
C. An increase in the biodiversity of the body of water.  
D. Sequestration of dissolved toxins in lake sediments.

Montgomery - Chapter 17 #4

5. When the source of pollutant is readily identified by one location then the type of pollution is called  
**A.** Point source.  
B. Nonpoint source.  
C. Leachate.  
D. All the choices are correct.

Montgomery - Chapter 17 #5

6. Point sources of pollution include all of the following except  
A. A septic tank leaking sewage.  
**B.** Salt runoff from roads.  
C. Wastewater from a factory.  
D. Organic matter discharged from a meat-packing plant.

Montgomery - Chapter 17 #6

7. The gases produced as a byproduct of anaerobic decomposition include  
A. Hydrogen sulfide and ethane.  
B. Hydrogen sulfide and propane.  
C. Hydrogen sulfide and butane.  
**D.** Hydrogen sulfide and methane.

Montgomery - Chapter 17 #7

8. In water, the organic matter load is explained by the  
A. Biological oxygen demand.  
B. Biophysical oxygen demand.  
C. Biometric oxygen demand.  
**D.** Biochemical oxygen demand.

*Montgomery - Chapter 17 #8*

9. Groundwater pollution  
A. Comes only from non-point pollution sources, like fertilizer runoff from farmland.  
B. Is readily detectable because the presence of pollutants is obvious from the water's taste or smell.  
**C.** Is very difficult to clean up once it has occurred.  
D. All of the choices are correct.

*Montgomery - Chapter 17 #9*

10. Nitrate in groundwater can be increased by infiltration of runoff from all of the following except  
A. Manure from cattle feedlots.  
B. Fields treated with synthetic fertilizers containing nitrogen.  
C. Sewage-treatment waste water.  
**D.** Glacial melt.

*Montgomery - Chapter 17 #10*

11. Volumetrically, the largest non-point source of pollution in the United States is  
**A.** Cropland.  
B. Forested land.  
C. Mine sites.  
D. Urban storm water runoff.

*Montgomery - Chapter 17 #11*

12. The dose-response curve for arsenic  
**A.** Shows no benefit to low concentrations and great harm from high concentrations.  
B. Shows that arsenic is beneficial to humans when consumed in low quantities, but toxic at high quantities.  
C. Was a major factor in setting the new, lower drinking-water standard for dissolved arsenic of 10 ppb in public water supplies.  
D. Shows that microorganisms can be very helpful in decontaminating a site with high arsenic levels.

*Montgomery - Chapter 17 #12*

13. Mercury  
A. Is most toxic to humans in the form of methyl mercury.  
B. Is bio-concentrated (concentrations increase up the food chain), with the result that large fish like tuna may contain unacceptable levels.  
C. May be added to the atmosphere through the burning of coal, incineration of waste, smelting . association with ore processing and processing of batteries.  
D. Is transferred from the atmosphere into water, where microorganisms transform it to methyl mercury.  
**E.** All of the choices are correct.

*Montgomery - Chapter 17 #13*

14. Lead, mercury and plutonium are these that have a tendency to accumulate in organisms.  
A. Radioactive metals  
B. Precious metals  
C. Native metals  
**D.** Heavy metals

*Montgomery - Chapter 17 #14*

15. The toxicity of industrial pollutants may go unrecognized for all of the following reasons except  
**A.** They often cause skin and eye irritation.  
B. Their harmful effects may be slow to develop.  
C. They may be harmful only in some concentrations or circumstances.  
D. They cannot be tested for safety on all organisms.

*Montgomery - Chapter 17 #15*



16. Thermal pollution differs from most chemical pollution in that  
A. Despite being called "pollution", it causes no real harm.  
**B.** It is localized in impact and short-lived.  
C. It has by now effectively been eliminated as an environmental hazard.  
D. All of the choices are correct.

Montgomery - Chapter 17 #16

17. In an agricultural region,  
**A.** Spring planting and application of fertilizers and herbicides can result in concentration spikes of these chemicals in rivers, due to spring rains.  
B. Crops generally use the fertilizer applied to enhance their growth very efficiently.  
C. Herbicides and pesticides are retained in the soil and do not present a water-pollution threat.  
D. The use of filter strips in riparian zones (areas adjacent to streams) has not been demonstrated to be effective in reducing nutrient loading of streams.

Montgomery - Chapter 17 #17

18. Improper agricultural techniques increase erosion rates nine times higher than normal resulting in  
A. Sediment erosion.  
**B.** Sediment pollution.  
C. Sediment aggregation.  
D. Sediment increase.

Montgomery - Chapter 17 #18

19. A lake may be described as "dead" when its condition is  
A. Eutrophic.  
B. Aerobic.  
**C.** Anaerobic.  
D. Saline.

Montgomery - Chapter 17 #19

20. Breakdown of organic matter in the absence of oxygen is this type of decay.  
A. Aerobic  
**B.** Anaerobic  
C. Biochemical  
D. Eutrophic

Montgomery - Chapter 17 #20

21. Biochemical oxygen demand is the amount of oxygen needed  
A. By humans to breathe.  
B. By all organisms in a system, both plants and animals.  
**C.** For aerobic breakdown of organic matter in a system.  
D. To destroy all chemical pollutants in a system.

Montgomery - Chapter 17 #21

22. Dumping lawn clippings into a stream will reduce this  
A. Flow rate.  
**B.** Dissolved oxygen.  
C. Dissolved nitrogen.  
D. Biochemical oxygen demand.

Montgomery - Chapter 17 #22

23. Water containing an abundance of nutrients, which encourages lush growth of such plants as algae is termed  
**A.** Eutrophic.  
B. Aerobic.  
C. Biochemical.  
D. Accumulative.

Montgomery - Chapter 17 #23

24. Eutrophication of water is accelerated by  
**A.** Increased sediment load from erosion.  
B. Addition of oxygen.  
C. Reduction in phosphate input.  
D. Reduction in nitrate input.

Montgomery - Chapter 17 #24

25. What develops as a result of migration of the pollutant by groundwater that forms down-gradient with reference to the point source  
A. Contaminant dome.  
B. Contaminant deposit.  
C. Contaminant basin.  
**D.** Contaminant plume.

Montgomery - Chapter 17 #25

26. Groundwater pollution in situ is commonly handled by  
**A.** Waiting for the pollutants to disperse or break down.  
B. Chemical decontamination to remove the pollutants.  
C. Aeration to restore oxygen levels.  
D. All of the choices are correct.

Montgomery - Chapter 17 #26

27. Ground water contaminated with acid rain percolates through a limestone aquifer. With longer residence time in the aquifer system,  
A. Dissolved sulfate in the water will increase.  
B. Dissolved nitrate in the water will increase.  
**C.** Dissolved bicarbonate in the water will increase.  
D. All of the choices are correct.

Montgomery - Chapter 17 #27

28. Dredging of a lake bottom  
A. May be done to remove toxic pollutants attached to sediment particles.  
B. Can cause sediment pollution.  
C. May reduce nutrient recycling from sediments.  
**D.** All of the choices are correct.

Montgomery - Chapter 17 #28

29. The escape of nutrients from sediments can be reduced or eliminated by any of the following strategies except  
A. Dredging.  
**B.** Aeration.  
C. Chemical treatment of the sediment.  
D. Emplacement of a plastic or impermeable clay barrier over the bottom sediments.

Montgomery - Chapter 17 #29

30. Pump and treat technique is used for reversing the damage for  
A. Streams.  
B. Lakes.  
**C.** Groundwater.  
D. Estuaries.

Montgomery - Chapter 17 #30

31. Which of the following statements is not true?  
A. Chemical treatment of sediment can be effective in reducing pollution problems, but it must be repeated every few years  
B. Fast-flowing streams are generally better aerated than are lakes  
**C.** A body of water is described as "dead" when it contains fatal concentrations of toxic chemicals  
D. An oxygen sag curve describes changes in a stream's dissolved oxygen content along its length below an organic-matter source

Montgomery - Chapter 17 #31

32. Use of microorganisms to break down toxic organic compounds in ground water is called  
**A.** Bioremediation.  
B. Aerobic decay.  
C. Anaerobic decay.  
D. Eutrophication.

Montgomery - Chapter 17 #32

33. The pump-and-treat method is  
**A.** The surface treatment of polluted groundwater that has been removed from an aquifer.  
B. The process by which municipal sewage is treated before discharge into a river.  
C. Ineffective in cleansing contaminated water well enough to be used as a drinking water supply.  
D. A fast, effective and inexpensive means of treating contaminated groundwater.

Montgomery - Chapter 17 #33

34. Given the quantitative definition of residence time, the effect of increasing the rate of input of a chemical into a natural system at equilibrium would be to increase the chemical's residence time.  
**FALSE**

Montgomery - Chapter 17 #34

35. Naturally occurring concentrations of some toxic elements, such as arsenic, may exceed both recommended "safe" levels and wastewater standards for industry.  
**TRUE**

Montgomery - Chapter 17 #35

36. The threat posed by some synthetic chemicals is difficult to assess because of lack of knowledge of their residence times in natural systems.  
**TRUE**

Montgomery - Chapter 17 #36

37. A factory illegally dumps arsenic-rich wastewater into a lake, where the residence time of the arsenic is 10 years. If the dumping stops, after 30 years, the amount of arsenic in the lake will be one-third what it was when the dumping was stopped.  
**FALSE**

Montgomery - Chapter 17 #37

38. Nonpoint pollution sources are more diffuse and thus harder to monitor and control than are most point sources.  
**TRUE**

Montgomery - Chapter 17 #38

39. Because groundwater flow rates are often slow, groundwater pollution may first be detected many years after the occurrence of contamination and in areas distant from the pollution source.  
**TRUE**

Montgomery - Chapter 17 #39

40. Concern about environmental pollution is such that comprehensive health hazard information has now been determined for most synthetic drugs and agricultural and industrial chemicals.  
**FALSE**

Montgomery - Chapter 17 #40

41. Heavy metals accumulate in organisms, increasing in their amount up a food chain because they are concentrated in larger and larger organisms.  
**TRUE**

Montgomery - Chapter 17 #41

42. Mercury is so toxic in all its forms that it is no longer used except as a poison, as in fungicides.  
**FALSE**

Montgomery - Chapter 17 #42

43. Eutrophication does not occur naturally; it is the result of human activities altering the nutrient balance in water.  
**FALSE**

Montgomery - Chapter 17 #43

44. Eutrophication caused by excess runoff of nitrate and phosphate fertilizer from farmland could be avoided by substitution of natural, organic fertilizers, like manures, for synthetic fertilizers.  
**FALSE**
45. An oxygen sag curve describes how oxygen in a body of water is consumed by organisms, such as fish.  
**FALSE**
46. Use of settling ponds below farm fields reduces sediment pollution of surface runoff water.  
**TRUE**
47. After the dangers of DDT were recognized, use of toxic organic chemicals in agriculture was virtually eliminated in the United States.  
**FALSE**
48. Pollution of surface water has nothing to do with pollution of groundwater.  
**FALSE**
49. Groundwater pollution can be reduced by introduction of microorganisms that may break down some of the wastes.  
**TRUE**
50. Chemical decontamination is principally used for small toxic-waste spills in surface waters.  
**TRUE**
51. Discharge of effluent from a water treatment plant into a stream increases the BOD of the water.  
**TRUE**
52. If ground water is contaminated with petroleum products, pumping from a level close to the water table may selectively extract much of the pollution.  
**TRUE**
53. Groundwater pollution is most often and most effectively treated in situ, which minimizes the risk of spreading the pollution.  
**FALSE**
54. Chemical surveys by aircraft can help identify sites of particularly high probability of toxic-element contamination, such as areas affected by acid mine drainage.  
**TRUE**

Montgomery - Chapter 17 #44

Montgomery - Chapter 17 #45

Montgomery - Chapter 17 #46

Montgomery - Chapter 17 #47

Montgomery - Chapter 17 #48

Montgomery - Chapter 17 #49

Montgomery - Chapter 17 #50

Montgomery - Chapter 17 #51

Montgomery - Chapter 17 #52

Montgomery - Chapter 17 #53

Montgomery - Chapter 17 #54

## 17 Summary

<u>Category</u>	<u># of Questions</u>
Montgomery - Chapter 17	54