

**Chapter 13 & 20 Review Questions + Problem Set**

Directions- On loose-leaf paper, answer the following questions in well-written complete sentences. You do not need to write the question. Number each answer so the number corresponds the question that you have answered. **Only hand-written responses will be accepted. Typed or emailed copies will not be graded.**

**Chapter 13 Review Questions**

1. Discuss the importance of the Colorado River basin in the United States and how human activities are stressing this system.
2. Describe how water is recycled by the hydrologic cycle and how human activities can overload and altered this cycle.
3. Define groundwater, zone of saturation, water table, and aquifer.
4. Distinguish among surface water, surface runoff, and reliable surface runoff.
5. Explain why much of the area in 36 states is likely to suffer from water shortages throughout most of this century.
6. What are five major problems resulting from the way people are using water from the Colorado River basin?
7. Define and give an example of a water footprint.
8. Why do many analysts view the likelihood of greatly increasing water shortages as one of the world's most serious environmental problems?
9. Describe the connection between water shortages, grain imports, food prices, and malnutrition.
10. What are the advantages and disadvantages of withdrawing groundwater?
11. Describe the problem of groundwater depletion in the world and in the United States, especially over the Ogallala aquifer.
12. Describe the problems of land subsidence and contamination of freshwater aquifers near coastal areas resulting from the overdrawing of water from aquifers.
13. Describe ways to prevent or slow groundwater depletion, including the possible use of deep aquifers.
14. What are the advantages and disadvantages of using large dams and reservoirs?
15. Describe what has happened to water flows in the Colorado River since 1960, other problems that are likely to further decrease its supply of water, and the likely consequences of such changes (Core Case Study).
16. What ecological services do rivers provide?
17. Describe some problems associated with the use of the Colorado River basin.
18. What are the advantages and disadvantages of China's Three Gorges Dam?
19. Describe the California Water Project and the controversy over this water transfer project.
20. Describe the environmental disaster caused by the Aral Sea water transfer project.
21. Define desalination and distinguish between distillation and reverse osmosis as methods for desalinating water.
22. What are three major limitations on the widespread use of desalination?
23. What are two major causes of water waste?
24. Describe four irrigation methods and list ways to reduce water waste in irrigation in more- and less-developed countries.
25. List four ways to reduce water waste in industry and homes and four ways to use water more sustainably and four ways in which you can reduce your use and waste of water.
26. What is a floodplain and why do people like to live on floodplains?
27. What are the benefits and drawbacks of floods?
28. List three human activities that increase the risk of flooding.
29. Describe the increased flooding risks that many people in Bangladesh face and what they are doing about it.
30. List three ways to reduce the risks of flooding.

**Chapter 20 Review Questions**

1. Describe the cleanup of Lake Washington near Seattle (Core Case Study) and list the three lessons learned from this process.
2. What is water pollution?
3. Distinguish between point sources and nonpoint sources of water pollution, and give an example of each.
4. List nine major types of water pollutants and give an example of each.
5. List three diseases transmitted to humans by polluted water.
6. Describe chemical and biological methods that scientists use to measure water quality.
7. Describe how streams can cleanse themselves and how these cleansing processes can be overwhelmed.
8. Describe the state of stream pollution in more-developed and less-developed countries.
9. Give two reasons why lakes cannot cleanse themselves as readily as streams can.
10. Distinguish between eutrophication and cultural eutrophication.
11. List ways to prevent or reduce cultural eutrophication. Describe the pollution of the Great Lakes and the progress made in reducing it.
12. Explain why groundwater cannot cleanse itself very well.
13. What are the major sources of groundwater contamination in the United States?
14. Describe the threat from arsenic in groundwater.
15. List ways to prevent or clean up ground-water contamination.
16. Describe three ways to provide safe drinking water in poor countries.
17. Describe U. S. laws for protecting drinking water quality.
18. Describe the environmental problems caused by the wide-spread use of bottled water.
19. How are coastal waters and deeper ocean waters polluted?
20. What causes harmful algal blooms and what are their negative effects?
21. Describe oxygen depletion in the northern Gulf of Mexico.
22. How serious is oil pollution of the oceans, what are its effects, and what can be done to reduce such pollution?
23. Describe the effects of the 1989 Exxon Valdez oil spill in Alaskan waters.
24. List ways to reduce water pollution from (a) non-point sources and (b) point sources.
25. Describe the U. S. experience with reducing point-source water pollution.
26. What is a septic tank and how does it work? Describe how primary sewage treatment and secondary sewage treatment are used to help purify water.
27. What are the options for dealing with sewage sludge?
28. Describe how we can use wetlands to treat sewage.
29. List six ways to prevent or reduce water pollution.
30. List five things you can do to reduce water pollution.

**Problem Set → Show All Work Do Not Use A Calculator****Free Response Questions****31. Drought in the Midwest**

The summer of 2012 will be remembered for the severe drought conditions that plagued much of the country. Wisconsin farmers were hit particularly hard. Several stations in the south central sections of the state broke records that have stood for over 110 years. Madison, which normally receives 10 cm of rain in June received only 0.75 cm. The drought has caused a great reduction in crop yields. One farmer reported only 35 bushels of corn; normally there are 200 bushels per hectare.

- What is the percent reduction in rainfall (Madison in June 2012) from normal levels?
- If a farmer has a field that is  $10,000 \text{ m}^2$  and .75cm of rain falls on the field, what is the volume (in  $\text{m}^3$ ) of rain that has infiltrated?

**32. Flooding in Fremont**

Like many communities, Fremont has a combined sewer system that collects both sewage and storm water. When storm water runs into storm drains that connect to the city's sanitary sewer system, the storm water and sewage flow together to the Fremont Wastewater Treatment Plant (FWTP). During a major storm event, however, the combined volume of storm water and sewage may exceed the plant's capacity, and the overflow bypasses the FWTP. The untreated overflow is discharged into Fremont Creek along with the treated waste. Recently parts of Fremont received 5 cm of rain in 60 minutes. The storm caused widespread flooding in the northeast section of town. Especially hard hit was the Shoppes at Fremont shopping center.

Use the data from the table below to answer the questions that follow. Show all calculations.

Fremont Water Data
The shopping center's parking lot is 200 meters long and 100 meters wide.
Fremont has an area of $10 \text{ km}^2$ .
Impervious surfaces cover 20 percent of Fremont's area.
The FWTP typically treats $5,000 \text{ m}^3$ of domestic sewage per day.
The FWTP has the capacity to treat $10,000 \text{ m}^3$ of combined sewage and storm water per day.

- Calculate** the volume of water (in  $\text{m}^3$ ) that runs off the Shoppes at Fremont parking lot after a 5 cm rainfall event. Assume that all the water that falls on the parking lot runs off.
- Calculate** the volume of storm-water runoff (in  $\text{m}^3$ ) generated in all of Fremont by the 5 cm rainfall event. Assume that only the impervious surfaces generate runoff.
- Assume that all the runoff that you calculated is captured by the storm sewers in one day. **Calculate** the volume of untreated water (in  $\text{m}^3$ ) that bypasses the plant as a result of the storm. (Note that the plant still receives  $5,000 \text{ m}^3$  of domestic sewage per day.)

Frontline: Poisoned Waters

**Directions-** Go to the <http://video.pbs.org/video/1114515379/> and watch the PBS video Frontline: Poisoned Waters. The show is two hours long so you may want to watch it in 2-60 minute intervals, 3-40 minute intervals, or 4-30 minute intervals. While you are watching answer the questions below on loose-leaf paper.

1. What is the difference in the number of bushels of crabs caught in Chesapeake Bay from 25 years ago?
2. What commercial fishery has been totally lost in Chesapeake Bay?
3. What is the primary cause of the loss of fisheries?
4. What makes Chesapeake Bay so vulnerable?
5. What phenomenon is growing in the Bay?
6. Responding to public pressure, what did President Nixon create?
7. What was one of the new laws passed to support the EPA?
8. What were some of the actions taken by the head of the EPA?
9. There are two steps to pollution control that they took. What were they?
10. What are the two nutrients in human waste that cause the overproduction of algae?
11. How is nitrogen removed from sewage?
12. What was the result of the new voluntary program implemented by President Reagan?
13. What is **LEACHATE**?
14. What else besides nitrogen and phosphorus was in the chicken manure leachate?
15. What does factory farming do to prices?
16. What is the largest source of pollution to the Chesapeake Bay and all of the country?
17. What is the biggest contributor to low water quality, fish stock depletion, and fish species extinction?
18. The biggest problem with manure is what?
19. What was the water pollution in the Potomac producing in the male small-mouth bass testes?
20. What causes this phenomenon called “intersex”?
21. What are some of the everyday products that we use that have endocrine disrupters in them?
22. How does the EPA regulate or measure these contaminants in the environment?
23. What do few people realize about their drinking water?
24. What amount of the ‘EMERGING CONTAMINANTS’ (those new contaminants with no testing done on them) are found in drinking water AFTER it has been treated?
25. What is the REAL CONCERN about Toxicology?
26. How many people are exposed to endocrine disrupters in the Mid-Atlantic region?
27. What are some effects seen in people exposed to endocrine disruptors?
28. Why are Orcas a good species to use for measuring the effects of pollution?
29. What is being found in their blubber?
30. From where do the younger whales get their PCB’S?
31. What is the EPA’s SUPERFUND?
32. Where is most of the pollution found in the river now?
33. Define LEGACY POLLUTION:
34. What was the highest level in ppm (parts per million) of PCB’s found at Malarkey Cement, what is the EPA upper limit, and what is the residential limit?
35. What is now labeled as the “#1 menace to our waterways”?
36. How much “untreated toxics” are put into Puget Sound per day?
37. What is at the heart of the problem of storm water runoff?
38. What is the KEY to storm water runoff?
39. How many people move into/many acres of forest are lost in the Chesapeake Bay watershed?
40. What is the result of too many impervious surfaces, in terms of surface runoff?
41. How many Americans live on or near our waterways?
42. What is the key to SMART GROWTH?
43. What are some of the things being fixed with SMART GROWTH redevelopment?
44. *Explain why the Chesapeake Bay is considered a canary in a coal mine in terms of U.S. water quality.*
45. How many years do we have to take DEFINITIVE action to protect our waters?
46. What bodies of water in Connecticut are probably being impacted in the same way as Chesapeake Bay and Puget Sound?