

2010 Area 1 Envirothon
Shelby/Mansfield KOA, Crawford County, Ohio
C.E.I

"Protection of Groundwater Through Urban, Agriculture and Environmental Planning"

Do not write answers on this paper.

- o *Indicate the one best answer for each question on the "CEI" Scantron answer card.*
- o *Use a No. 2 pencil*
- o *Erase completely to change*

1. Which of these activities at home or farm is most likely to cause groundwater contamination?
 - A. Washing and polishing vehicles
 - B. Dumping waste fluids on the ground
 - C. Starting up and running an old, worn engine
 - D. Replacing worn brake rotors and calipers
 - E. Storing antique farm equipment in a building.
2. Which of these can be a source/sources of nutrients in urban residential areas?
 - A. Mowing the lawn
 - B. Applying weed and feed on lawns
 - C. Feces left on tree lawns when pet walking
 - D. B and C are sources
 - E. All of the above.
3. Which of the following are sources of pathogens in groundwater in urban and residential areas?
 - A. Concentrations of bird and animal feces in contact with the ground
 - B. Applying weed and feed on the lawn
 - C. Leaking septic tanks or leach fields in contact with groundwater
 - D. Leaking water supply lines
 - E. A and C are sources.
4. Which of these is a likely route for people to become sick from groundwater contamination?
 - A. Drinking from an unprotected spring frequented by deer
 - B. Drinking water from a water well with a cracked or corroded well casing
 - C. Drinking water from a well that is close to a leaking septic tank
 - D. Any of these can cause sickness if there is enough contamination
 - E. None of these can cause sickness.
5. Which of the following describes a condition that would improve the chances of pathogenic bacteria being drawn into drinking water?
 - A. Cracked or corroded water well casing
 - B. A failed septic tank close to a water well
 - C. Water collecting in a well pit and entering the well by way of a bad well seal
 - D. An old dug well left open near a newer water well
 - E. All of these can result in pathogens entering a well.

6. Which of the following provide opportunities for causing groundwater contamination during pesticide/fertilizer handling?
 - A. Spilling concentrated herbicide on sandy ground
 - B. Back-siphoning herbicide mix from the mixer tank into a well when the well pump stops
 - C. Throwing empty herbicide jugs into a sinkhole
 - D. All of these can cause contamination
 - E. None of these are likely to cause contamination.
7. Which of the following are properties of modern herbicides that reduce the chances of contaminating groundwater?
 - A. They break down to harmless substances after exposure to sunlight and oxygen
 - B. They cling to soil particles when applied to soil
 - C. They are applied by personnel trained in their use
 - D. Nothing reduces the chances of herbicide contamination once applied to soil
 - E. A, b, and c all function to reduce contamination incidence.
8. Which of the following is recommended to reduce the chance of well contamination?
 - A. Locating a well away from sources of contamination
 - B. Following state well construction standards
 - C. Retaining the services of a water witch
 - D. All of the above
 - E. A and b.
9. Which of these is a good environmental reason to remove that old wooden decorative “windmill” on grandma’s well and throw it on the burn pile?
 - A. It is ugly and angers the earth’s spirits
 - B. It houses insects and other small animals that can crawl into the well and die
 - C. Grandpa always hated it and will pay you to do it
 - D. Wood holds scents and makes the well more attractive for animal marking
 - E. B and d.
10. If an old windmill well is left undisturbed in a crop field, which of the following can happen?
 - A. The windmill poses a hazard to field work
 - B. Herbicides and pesticides can have a path to the water table
 - C. People may be tempted to dump junk or contaminants that can cause contamination
 - D. All of these can happen
 - E. Nah, none of this is going to happen.
11. What document, available from the Ohio Department of Natural Resources, is the mostly likely document to be available to inform rural property owners about their water supply?
 - A. A coliform bacteria test report
 - B. A laboratory chemical test report
 - C. A hydrogeologist’s aquifer test report
 - D. A well construction log
 - E. A county groundwater resources map.

12. What document is required to be filed by a water well contractor with the Ohio Department of Natural Resources when completing new well construction?
- A coliform bacteria test report
 - A laboratory chemical test report
 - A hydrogeologist's aquifer test report
 - A well construction log
 - A water dowser's log.
13. If an unused water well is present on a property, what is the responsibility of the property owner?
- Put an orange plastic cone over it
 - Properly seal the well according to state requirements
 - Fill the hole with dirt and brush
 - The property owner has no responsibility to do anything about it
 - Restore the well to function at all costs.
14. The area of your field site may have the following geologic properties – which is the *least* likely to be contaminated by surface land activities?
- Sandy loam at 0-5 ft – clay 5-45 ft – shale rock 45-55 ft – sandstone 55-100 ft, water table at 50 ft
 - Sandy loam at 0-5 ft – sand 5-45 ft – shale rock 45-50 ft – sandstone 50-100 ft, water table at 15 ft
 - Sandy loam at 0-7 ft – sand 5-15 ft – cavernous limestone rock 15-50 ft – shale 50-100 ft, water table at 15 ft
 - There is no way to tell what will happen – it is all a mystery
 - Nothing can slow down surface contamination by humans.
15. In a location where the soil conditions generally protect groundwater from contamination by surface activities, which of the following can provide a path for contamination to reach the water table?
- Leaving abandoned wells open and unsealed
 - Installing hundreds of geothermal boreholes without sealing the holes
 - Leaving deep excavations uncovered or unfilled
 - All of these can
 - None of these is going to provide a pathway.
16. You are looking at a series of well construction logs as you decide whether or not land activities are likely to cause groundwater contamination. Which of the following is the most vulnerable to groundwater contamination?
- Sandy loam at 0-5 ft – clay 5-45 ft – shale rock 45-55 ft – sandstone 55-100 ft, water table at 50 ft
 - Sandy loam at 0-5 ft – sand 5-45 ft – shale rock 45-100 ft, water table at 65 ft
 - Sandy loam at 0-7 ft – sand 5-15 ft – cavernous limestone rock 15-50 ft – shale 50-100 ft, water table at 15 ft
 - There is no way to tell what will happen – it is all a mystery
 - Nothing can slow down surface contamination by humans.
17. In an area of suburban housing developments with sandy soil and using wells for water supply, tapping an aquifer in limestone (water table 15 ft), which of the following policies would you recommend to avoid chemical contamination:
- Execution for buying and stocking any garden pest control chemicals
 - Banning commercial liquid herbicide-fertilizer application
 - Encouraging people to install xeriscape landscaping
 - Switching from wells to a public water supply that gets water from Lake Erie
 - Nothing is going to prevent contamination.

18. Your village's water supply for 2000 people is provided by a 50-acre wellfield hosting three wells developed in sandstone. Which of the following policies would you recommend to prevent contamination of this water supply asset?
- Delineate a source water protection area (SWAP), based on science and valid information, and develop and enforce a protection plan for the SWAP (a source water protection plan – SWPP)
 - Buy up all private land in a 10-mile radius and plant the land in trees
 - Turn the 50-acre field into grazing land for llamas
 - Designate the land for the annual combine demolition derby
 - Delineate a SWAP and write a plan, and put the plan on the shelf for later.
19. What would be the benefit to groundwater quality of establishing an artificial wetlands downstream from a small village where house wastewater is treated using septic tanks?
- Increases the *Phragmites* habitat that attracts ducks
 - Provides finishing treatment for wastewater before it recharges groundwater
 - Provides a reason to avoid pumping septic tanks
 - Causes the soil to seal off so that groundwater recharge is delayed
 - Provides no benefit.
20. How does maintaining grassed waterways and other erosion-control measures contribute to groundwater protection?
- Keeps field runoff from leaving fields and entering waterways or recharge points
 - Cuts down on cropland and thus reducing nitrogen loading
 - Increases the insect population so that fewer herbicides are needed
 - These do not work – waterways are a scam to get government money instead of doing real farm work
 - B and c.
21. If a farmer finds a limestone sinkhole that has developed on cropland, what should be her response to avoid groundwater contamination?
- Make sure no one from the government sees it
 - Funnel stormwater into the sinkhole so it goes below the groundwater
 - Fill the sinkhole with soil and rock so it is eliminated
 - Establish and maintain grassed barriers around it and divert runoff to drainage
 - Store herbicide containers there to avoid filling the county landfill.
22. The Ohio Environmental Protection Agency (EPA) establishes source water protection areas (SWAP) around sources of groundwater supply such as village wellfields. These may be several acres to square miles in size depending on how much water is withdrawn and hydrogeologic conditions. Which of the following is true of SWAP management in Ohio?
- SWAP can be delineated based on textbook values and area estimates
 - According to the Ohio Department of Agriculture, manure can be spread on land as close as 300 ft from public water supply wells, regardless of the delineation of a SWAP
 - SWAP protection plans (SWPP) are developed as a combined effort of the Ohio EPA and local public water suppliers.
 - Geothermal loop systems and quarries can be established in SWAP
 - All of the above.

23. A SWAP delineation (determining its size and shape) is based on a mathematical model of groundwater flow direction and rates, and water withdrawn by the water supply. Such modeling efforts depend on accurate information to be useful. Which of the following combinations would result in the most valid SWAP in your estimation?
- A. Using the most modern and powerful MacOS computer and high end graphics, the SWAP is delineated by a state official using the latest textbook information
 - B. Using a model that closely matches the local groundwater hydrology conditions, a scientist known as a hydrogeologist delineates the SWAP based on information gathered from tests within the SWAP vicinity
 - C. Using virtual reality, a professional avatar uses hyperinflation to rectify the phenomenological parameters to define the SWAP.
 - D. First an engineer builds a plywood and sand model the size of the aquifer, then takes measurements, then models the results to define the SWAP
 - E. Any way you want to do it is OK as long as the Ohio EPA approves it.
24. A number of trades and professions that may affect public health are licensed by the State of Ohio, with licenses requiring continuing education to stay in force. Which of the following do you think are licensed but do not require any formal training or continuing education?
- A. Hairdressers
 - B. Public water supply operators
 - C. Engineers
 - D. Water well contractors
 - E. Of course these all require formal training.
25. "Karst" limestone is named after a flat plain in the Balkan region of Europe where limestone is close to the surface. Which of the following are features of a *karst terrane*?
- A. Caves and sinkholes
 - B. Beech and maple trees
 - C. Long, winding streams
 - D. Really good building sites
 - E. People speak Serbo-Croatian.
26. Shale is black, gray or brown rock made up of cemented clay particles. Which of the following do you think describe shale as a source of water for wells?
- A. Shale provides abundant and high-quality water for wells
 - B. Shale may provide limited water to wells that may be enough for households, but quality is often poor
 - C. Shale yields no water whatsoever to wells
 - D. Shale is dangerous for drillers and is always avoided.
 - E. Shale can be all things to all people.
27. Sandstone is made of sand-sized particles cemented together. Which of the following do you think best describe how groundwater flows through sandstone?
- A. Sandstones yield no water to wells
 - B. Sandstones usually yield low flows and poor quality black water
 - C. Sandstones often yield abundant water for private and public wells via pores and fractures in the rock
 - D. Groundwater flows through room-sized caves in sandstone
 - E. Groundwater is stopped by sandstone until it encounters a shale layer.

28. If someone emptied dry cleaning machine chemical filters into a low spot on a sandstone ridge for about 20 years, which of the following would you expect to happen?
- A. The chemical seals the hole so nothing can flow into it
 - B. Lint from clothes seals the hole to prevent infiltration
 - C. Nothing as long as it never rains or snows
 - D. Chemical-laden water can infiltrate to the water table
 - E. The perpetrator quickly dies so the 20-year effort is unlikely to happen.
29. If manure spread on land over a groundwater aquifer exceeded the actual nutrient loading limit of the soil, which of the following would you expect to happen regarding groundwater?
- A. According to the Ohio Department of Agriculture, nothing
 - B. Nitrogen and other nutrients and bacteria can infiltrate to groundwater
 - C. Frequent tractor trips over the soil causes it to seal and nothing happens
 - D. Ohio soils seal off and no groundwater contamination can ever occur
 - E. A and b.
30. What is a working definition of the word “aquifer” as used for water supply in Ohio?
- A. Any porous geologic formation
 - B. A formation that holds and yields useful quantities of water to wells
 - C. A formation that can supply at least 1000 gallons per minute to wells
 - D. Any formation under a landfill or manure lagoon
 - E. Any unconsolidated geologic formation.

Answer Key:

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