

1. An instrument that detects the amount of light scattered at 90 degrees to the light source, throughout the water column:

- a. Secchi disk
- b. Turbidity test
- c. Nephelometric turbidity test**
- d. Turbidity comparator

2. The lower layer of cold, more dense water is referred to as the:

- a. Thermocline
- b. Hypolimnion**
- c. Epilimnion
- d. Benthic zone

3. Streams are classified according to orders. If two first-order streams join, flow through a valley, and are joined by another first-order stream, what is the final stream order?

- a. First order
- b. Second order**
- c. Third order
- d. Fourth order

4. In reference to Exhibit #1: What is the common name of this plant: **duckweed**

Due to this plant's ability to grow fast, it is being used by researchers to help remediate what current water pollution problem?

Removes phosphorus and nitrogen from the water and converts it to a form that doesn't negatively impact water quality

5. The density of this pond is greatest at:

- a. -4°C
- b. 0°C
- c. 4°C**
- d. 100°C

6. The primary sources of oxygen in this water body are the atmosphere and:

- a. Decomposition
- b. Evaporation
- c. Photosynthesis**
- d. Respiration

7. In reference to Exhibit #2: What is the correct order, family, and common name for this organism?

Odonata (Order)

Aeshnidae (Family)

Green Darner (Common name)

8. In reference to Exhibit #3: What is the correct order for this organism, common name, and in what type of aquatic habitat would you find this organism?

Coleoptera (Order)

Water Penny (Common name)

Stream or flowing water or riffle (Aquatic Habitat)

9. In this pond, the zone beneath the depth of effective light penetration but above the bottom is referred to as the:

- a. Littoral zone
- b. Limnetic zone
- c. Profundal zone**
- d. Benthic zone

10. In this pond, decomposition occurs primarily in the:

- a. Benthic zone**
- b. Littoral zone
- c. Limnetic zone
- d. Profundal zone

11. In reference to Exhibit #4, the soil sample collected from this site is classified as? **Hydric**

And exhibits three major characteristics: **Gleyed, Mottled, Concretions (will also accept iron or manganese concretions)**

12. In reference to Exhibit #5: Identify the 5 specimens labeled A, B, C, D and E; provide both common name and Order

- A. **Diptera** (Order) **Tepulid (will not accept crane fly larva as answer)** (Common Name)
- B. **Plecoptera** (Order) **Stonefly** (Common Name)
- C. **Hemiptera** (Order) **Water Boatman** (Common Name)
- D. **Ephemeroptera** (Order) **Mayfly** (Common Name)
- E. **Megaloptera** (Order) **Will accept either hellgrammite or dobsonfly larva** (Common Name)

13. In reference to Exhibit #5: compare the five specimens in question 12 – which would be considered the indicator of the highest water quality? **D**

14. Thermal stress and shock can occur when temperatures change more than:

- a. **1° – 2° C in 24 hours**
- b. 4° – 8° C in 24 hours
- c. 1° – 2° C in 48 hours
- d. 2° - 8° C in 48 hours

15. A scientist measures the temperature of a lake at various depths and finds very little variation between temperatures at the surface and at the bottom of the lake. The temperature measurements were most likely taken in a:

- a. Temperate lake during summer
- b. Temperate lake during winter**
- c. Tropical lake during summer
- d. Tropical lake during winter

16. The purest water containing the fewest solutes occurs in what form? **Clouds**

17. Invertebrates that feed on coarse particulate organic matter (CPOM) are referred to as:

- a. **Shredders**
- b. Gougers
- c. Grazers
- d. Collectors

18. Toxicity from Cyanotoxins have harmful effects on animals and humans. Match the toxin with caused effect:

- | | | |
|------------------|----------|--|
| A. Dermatotoxins | B | Disrupt proteins that keep the liver functioning, may act slowly (days to weeks) |
| B. Hepatotoxins | C | Cause rapid paralysis of skeletal and respiratory muscles (minutes) |
| C. Neurotoxins | A | Produce rashes and other skin reactions, usually within a day (hours) |

19. Which of the different types of algae pose the greatest risks for animals and humans?

- a. Green algae
- b. Red algae
- c. **Blue-green algae**
- d. Brown and gold algae

20. Match the aquatic equipment with its function pertaining to water quality sampling:

- | | | |
|--------------------------|----------|--|
| A. Underwater light trap | C | Colonize macroinvertebrates for sampling |
| B. Plankton Net | D | Bottom substrate sampler |
| C. Hester Dendy | B | Sampling protozoa and plankton in the upper water column |
| D. Peterson Grab | A | Collect light-sensing macroinvertebrates |

21. Any concentration of algae that causes impacts to an aquatic system that can be documented as hazardous to human or ecological health is considered:

- a. Human health impact
- b. Red tide
- c. Green algae bloom
- d. **HABs**



22. Which **TWO** are present in the photo above:

- a. **Phytoplankton**
- b. **Zooplankton**
- c. Aufwuchs
- d. Hellgrammites

23. Invasive terrestrial plants are problematic because they:

- a. Positively impact wildlife providing good shelter and breeding habitat
- b. Provide a food source for many different animals
- c. Are very diverse when found
- d. **Form monoculture plant communities which reduces biological diversity**

24. What type of wetlands would be found adjacent to the Ohio River?

- a. Fringe wetlands
- b. Mires
- c. Bogs
- d. **Bottomlands**

25. The installation of tile drainage systems on farms removes wetlands from the Midwestern landscape. This, combined with the loss of coastal marshes in the South are dramatically impacting:

- a. **Migratory waterfowl**
- b. Songbirds
- c. Amphibians
- d. Crayfish

26. According to Beck's Biotic Index, a stream that has an index of 6 – 9 would be considered:

- a. Grossly polluted
- b. Moderately polluted
- c. **Clean, but with a monotonous habitat**
- d. Clean

27. According to Beck's Biotic Index, organisms that would fall under Class III Organisms are:

- a. Sensitive or intolerant
- b. Questionable, uncertain, insufficient numbers
- c. Facultative
- d. **Tolerant**

28. Nitrogen is one of the most important constituents in water. There are three forms of nitrogen in water, nitrate-N($\text{NO}_3\text{-N}$), ammonia – N($\text{NH}_3\text{-H}$), and organic –N. In low-oxygen waters which of the three forms would be observed?

- a. Nitrate-N($\text{NO}_3\text{-N}$)
- b. **Ammonia – N($\text{NH}_3\text{-N}$)**
- c. Organic-N
- d. Nitrite

29. From the list below, which group is on the EPA selected national primary drinking water standards?

- a. Aluminum, arsenic, lead, zinc
- b. Arsenic, cadmium, sodium, selenium
- c. **Nitrate, mercury, cadmium, arsenic**
- d. Mercury, lead, barium, arsenic

30. It is late August and you notice that the water in this pond has turned a bright green color and looks very much like the image to the right. When you pull a sample, the texture of the substance is slimy and scum-like. Over the last few weeks, applications of fertilizer (10-10-10) have been applied to vegetation surrounding the pond, and heavy rainfall occurred immediately after a recent application. Identify the group of organisms causing this condition:



Answers accepted: microscopic algae, phytoplankton

Blue-green algae, cyanobacteria

31. What can be done to prevent future occurrences of algal blooms in this waterbody?
- a. Shade out the wetland to prevent aquatic plants and algae from being able to photosynthesize
 - b. Stock the wetland with white amur to feed on these organisms
 - c. Convince the land manager to apply fertilizer based on the results of a soil test and avoid applications before heavy rainfall occurs**
 - d. Do nothing – these blooms are not always preventable and only last for a few days. Just don't allow Fido to go swimming

Use the chart below to answer Question #32

Water Quality Test Results – Fernwood State Forest			
Testing Parameters	Limit		Results
pH	6-9	(range)	7
Dissolved Oxygen	6 mg/L	(min)	0.00001
Hardness (total)	50 mg/L	(max)	25
Nitrate	3 mg/L	(max)	2
Phosphate	0.025 mg/L	(max)	5
Sulfate	250 mg/L	(max)	200
Chloride	250 mg/L	(max)	126
Copper	1.3 mg/L	(max)	0.5
Manganese	0.05 mg/L	(max)	0
Iron	0.3 mg/L	(max)	0.2
Mercury	0.005mg/L	(max)	0

32. A sudden fish kill has occurred in this pond. You submit water samples for analysis. Using the results on the previous page, what is the most plausible story behind this fish kill?

- a. Acid mine drainage from past coal strip mining and current shale activity in the area has increased iron levels in the water to a toxic level for the fish.
- b. Runoff with a high level of nutrients drained into the wetland. This fueled algal and plant growth. As the algae and plants died off, the organic material decomposed, using up much of the available oxygen. With oxygen levels depleted, the fish died.**
- c. Even though the historical presence of mercury in the water was always below the maximum limit, fish accumulated mercury in their fatty tissues through a process known as biomagnification. In this process, the producers in the food chain (phytoplankton/algae) absorbed the mercury prior to being consumed by the fish. Since mercury is not excreted, it accumulates in the fish tissues. Mercury built up to a level that soon became toxic for the fish.
- d. Copper sulfate was applied to the wetland following label instructions to treat an algal bloom. However, the copper was not evenly mixed in the water and copper toxicity killed the fish.

A homeowner has a pond that she uses regularly for fishing. Lately, she has had an issue with submerged weeds that catch on fishing lines. The homeowner decides to try the product Diquat SLPC 2 L for control. **Use the Diquat SPC 2 L label provided to answer Questions 33 through 36:**

33. If Diquat is applied in a 0.50 gal/surface acre body of water, when can the pond be used for fishing again?

- a. 3 days
- b. 2 days
- c. 1 day
- d. No wait period**

34. For bottom placement applications, what type of adjuvant (substance added to the spray tank) improves the effectiveness of Diquat?

- a. Water carrier
- b. Copper-based algaecide**
- c. Invert emulsion
- d. No adjuvant is recommended

35. The pond owner has a severe infestation of Elodea, coontail, and several species of pondweeds. What application rate and intervals should he/she use?

- a. 0.50 gal at 14 to 21-day intervals
- b. 1.0 gal at 18 to 20-day intervals
- c. 2.0 gal at 14 to 21-day intervals**
- d. 3.0 gal at 18 to 20-day intervals