Water Quality Key:

Part One:

1. Winter
2. Spring Turnover
3. Early Summer
4. Late Summer
5. Early Fall
6. Fall Turnover
7. Phosphorus
8. Ca+2
9. Mg+2
10. Na+
11. K+
12. List and Describe any four of the following:

Prevention: It is better to prevent waste than to treat or clean up waste after it has been created. Atom Economy: Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product. Less Hazardous Chemical Syntheses: Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment. Designing Safer Chemicals: Chemical products should be designed to affect their desired function while minimizing their toxicity. Safer Solvents and Auxiliaries: The use of auxiliary substances (e.g., solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used. Design for Energy Efficiency: Energy requirements of

chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure. Use of Renewable Feedstocks: A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable. Reduce Derivatives: Unnecessary derivatization (use of blocking groups, protection/ deprotection, temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste. Catalysis: Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. Design for Degradation: Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment. Real-time analysis for Pollution Prevention: Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances. Inherently Safer Chemistry for Accident Prevention: Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.

13. Invertebrates
14. 5
15. Upside-down pyramids (phytoplankton have a relatively small combined biomass, but they support higher tiers with greater biomass)
16. -19. List any three following: Water Lily (Nymphaea), Duckweed (*Spirodela*), Pondweed (*Potamogeton*), Stonewort (*Chara*), Coontail (*Ceratophyllum*), Bladderwort (*Utricularia*), Cattail (*Typha*), Bulrush (*Scirpus*), Wild Rice (*Zizania*)
20. Phytoplankton are suspended in water, while periphyton are attached to surfaces

21. Amount of algae
22. Diatoms
23. Green Algae
24. Blue-Greens
25. Rate of nutrient supply, climate, shape of lake basin (morphometry)
26. List any three of the following (Noxious algal growth, Excessive macrophyte growth, Loss of clarity, Possible loss of macrophytes, Low dissolved oxygen, Excessive organic matter production, Blue-green algae inedible by some zooplankton, "Toxic" gases [ammonia, H2S] in bottom water, Possible toxins from some species of blue-green algae, Chemical treatment by lakeshore homeowners or managers may result, Drinking water degradation from treatment disinfection byproducts)
27. Limestone sinkholes of Florida, mountain lakes of the Pacific Northwest, glaciated landscapes of the Great Lakes region
28. Paleolimnology
29. -30 Caspian Sea/Lake Baikal and Lake Superior (any order accepted)
31. Anaerobic ammonium oxidation; the process by which anaerobic bacteria transform ammonium (NH_4^+) and nitrogen dioxide (NO_2) into nitrogen gas (N_2) and water (H_2O)
32. Chemical coagulants
33. Coagulation
34. Flocculation
35. Sand Filtration
36. A

37. D
38. Number of individuals that can be harvested from the population without affecting long term stability (average population size).
39. $$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$
40. Predation
41. Sediment
42. B
43. D
44. Any two of the following: ponds, basin marshes, ditches, reservoirs, seeps, lakes, and vernal / ephemeral pools.
45. Total dissolved solids
46. Any two of the following: Moving out of unfavorable areas, shutting up shells, digging borrows and excretion of excess salts, Actively drinking salt water, Increasing their respiratory water flow, Increase oxygen consumption, Flattening of the trunk, root and branches in a plan parallel to the wind direction.
47. Brooders
48. Broadcasters

Part Two:

Station A:

1. Caddisfly

2. Ephemeroptera, Plecoptera
3. 2 monthts to 2 years

Station B:

1. Crane Fly
2. They break down fallen leaves into smaller pieces that can then be consumed by smaller organisms
3. Spiders, praying mantis, bird

Station C:

1. Flatworm
2. Class 3 - Moderately Tolerant
3. Water is impacted by organic or nutrient pollution
4. True

Station D:

1. Deer Fly
2. Horse Fly
3. False
4. Large amounts indicate good oxygenation of water

Station E:

1. Water Boatman

2. Class 5: Air Breathing
3. True
4. False

Station F:

1. Eurasian Water Milfoil
2. True
3. Forms large mats of floating vegetation that will shade-out native aquatic plants

Station G:

1. Silver Carp
2. Grass Carp
3. Black Carp
4. Bighead Carp
5. True

Station H:

1. Predacious Diving Beetle
2. False
3. Indicate water pollution if populations are reduced because they are extremely sensitive