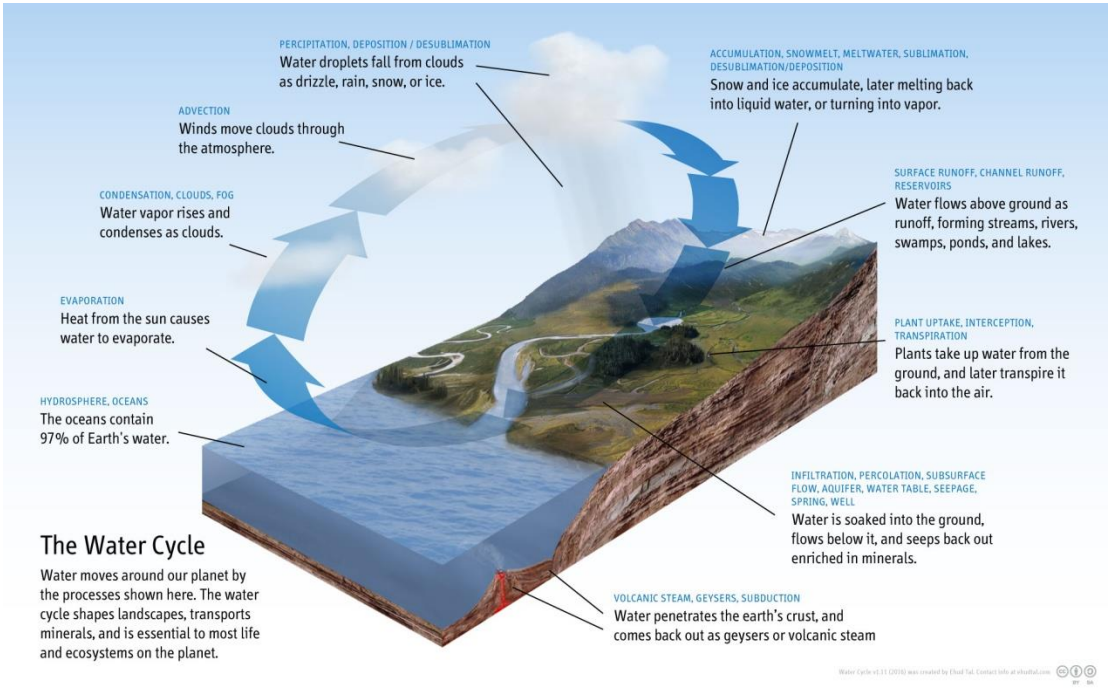
Aquatic Ecology Sample Test Questions

Section I. Abiotic and Biotic Factors and General Aquatic Knowledge

1. Diagram the hydrologic cycle, and describe at least 5 of its stages. (6 pts.)



2. Choose the best definition of a *watershed.* (1 pt.)
    a. A functioning, natural unit, with components of biotic and abiotic factors, whose boundaries are determined by the flux of energy input
    b. The surface zone of the planet, extending from within the Earth's crust, and up into the atmosphere, within which all water exists.
    c. The surrounding land where all water drains to a specific outlet point
    d. A building or structure created to store water as a means of conserving the resource for future needs, as in times of drought
    e. An even that is part of the hydrologic cycle where water is "shed" from the sky

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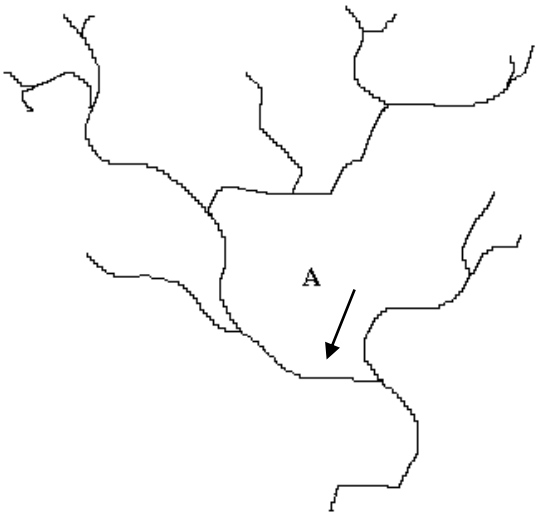
Watershed Drainage Pattern



3. Describe the type of watershed drainage pattern shown above. (1 pt.)
    a. Dendritic
    b. Parallel
    c. Trellis
    d. Radial
    e. Annular

4. From the same picture, determine the stream order at point A. (2 pts.)
    a. 2nd order
    b. 3rd order
    c. 4th order
    d. 10th order
    e. None of the above

5. Define what the abbreviation *TMDL* stands for, as well as what it is. (2 pts.) *TMDL stands for Total Maximum Daily Load. It is a measurable, water quality parameter, such as nutrient and sediment levels, which are federally mandated, to help protect certain waterways.*

6. Match the following words with the correct definition: (5 pts)

a. Eutrophication	__(b)___All the organisms, including animals, plants, fungi, and microorganisms, found in a given area
b. Biota	__(d)___the downward movement of water through the soil profiles
c. Substrate	__(a)___natural aging of a body of water
d. Percolation	__(e)___ Middle layer of stratified lake – water temp can fluctuate as much as 1°C per meter
e. Thermocline	__(c)___Attached surface of bottom material in which organisms can attach or live

Section II. Water Protection and Conservation

7. Explain the importance of Soil Conservation Water Quality Plans (SCWQP). (4 pts.)
Also referred to as a farm plan or conservation plan, it is a tool farmers can have developed for free, by local soil conservation districts, helping them protect and enhance the natural resources of their land, while encouraging productive and profitable farming operations at the same time. These plans identify and prioritize natural resource concerns on the farm and provide farmers with a blueprint for making environmental improvements. Typical plans include land use maps, soils information, inventories of resources, engineering notes, and other supporting information. Farm plans outline best management practices that can be installed by farmers based on time, money, and environmental need. Farm plans are required by the Federal Food Security Act on all highly erodible lands. They are required by the state on all farmland enrolled in Maryland Agricultural Land Preservation, as well as on farms located in the Chesapeake and Atlantic Coastal Bays Critical Area. Farm plans are also a key feature in Maryland's Watershed Implementation Plan to protect and restore the Chesapeake Bay.

8. Crop Residue is a conservation practice that lessens the impact of falling *rain* and helps hold *topsoil, soil or nutrients* onto the land. (2 pts.)
(any of these are acceptable)

9. A gully keeps eroding open in a corn field each spring. The farmer fills it in every year, but it keeps coming back. Which of the following conservation practices would you best recommend to help the farmer protect his resources? (1 pt.)
   a. Heavy Use Area Protection
   b. Grassed Waterway
   c. Riparian Buffer
   d. Crop Rotation
   e. Fencing

10. What is contour farming? (1pt.)
    f. When cool season crops are planted after fall harvest to help tie up nutrients through the winter and prevent them from being washed away.
    g. When long slopes are broken into shorter ones, by creating flat, step like ledges to farm.
    h. When crops are planted and tilled along the contours of the hill, instead of being plowed straight up and down the hill.
    i. When the land is divided into two or more paddocks, and livestock is rotated between each one as needed.
    j. When a berm is built across the contour of a slope to direct water to another area.

11. *No-till* farming reduces soil erosion by planting seeds in small holes between the existing ground cover, with less disturbance than traditional methods of tilling up the land. (1pt.)

12. What are some conservation practices that homeowners in more urban environments can do to protect their water resources? (4 pts.)

- *Use rain barrels to collect and slow runoff, allowing the water to be used at later times in smaller amounts on gardens or anything else, where it can help infiltrate and recharge the ground supply.*
- *Spread mulch around planting beds to hold in moisture, prevent erosion and provide nutrients.*
- *Maintain vehicles properly to prevent automotive fluids from leaking and potentially polluting the watershed.*
- *Plant rain gardens or other vegetative buffers along drainage ways to filter stormwater runoff.*
- *Install green roofs to filter rainwater, and help cool down surfaces that could create thermal pollution.*
- *Test soils to prevent over application of fertilizer.*
- *Encourage birds and other natural, insect predators to reduce the application of pesticides.*

13. A riparian zone is: (1 pts)
    a. The zone where emergent aquatic plants grow
    b. The headwaters of a river or stream
    c. The sediment bottom of a stream
    d. The land adjacent to the banks of a river or stream

14. Mr. Miller owns a dairy farm with a stream meandering through the middle. His cows have always had access to the stream to get their water, and allow them to cross between each side as needed, in order to graze the whole property. However, in order to help protect water quality, the state has created new legislation restricting farm animals from accessing streams anymore. Mr. Miller has come to you as a conservation planner. Analyze the situation and record what types of best management practices you would recommend to help Mr. Miller meet the new regulations, while still allowing him to make as much of a living off his land as possible? (8 pts.)

First, Mr. Miller needs to have livestock fencing put in. That will help him meet the regulations of the state, to keep his animals away from the stream. It will also be healthier for the stream, reducing the pollutants from the animal's wastes, being directly deposited in it, as well as reducing the stream bank erosion the animals were creating. Since the animals will have no access to water anymore, Mr. Miller will next need to install a livestock watering system. This will actually be healthier than letting his animals drink from the stream. If the water comes from a well it should have less chances of being polluted. Also vet bills should go down from reducing exposure to mastitis that dairy animals can get from loafing in wet areas. In order to continue grazing both sides of his property, a livestock stream crossing will need to be put in too. In the area that has been fenced off from the animals now, a riparian buffer could be planted along the stream banks. This will create a lot of benefits for the stream, helping to heal some of the damage the livestock had done in the past, as well as filtering out any manure runoff that could flow off the pastures. Pasture planting could also be done to help further enhance livestock nutrition, protect the soil from erosion and safeguard water quality. And finally rotational grazing could also be done to maintain a vigorous plant community and high quality forage. Several cost-share programs are available through the state and federal government to help pay for these practices. This will mean Mr. Miller won't have to put out as much money for it. In the end Mr. Miller should actually be more profitable than he was in the past, with both a healthier herd and environment too.

15. What are six benefits of establishing riparian buffers along stream banks. (6 pts.)

- *To stabilize stream banks and prevent erosion*
- *To filter runoff from surrounding lands*
- *To shade streams and control water temperatures*
- *To provide sources of food and nutrients to aquatic organisms*
- *To provide habitat for aquatic organisms*
- *To provide natural travel corridors for wildlife*

Section III. Urbanization, Stormwater and Impervious Surfaces

16. List at least three ways that increased impervious surfaces of urban areas threaten aquatic resources. (3 pts.)

- *Rainwater gets prevented from recharging ground water supplies.*
- *Stormwater runs off in higher amounts and velocities, which scour and erode stream banks.*
- *More pollution is washed into waterways.*
- *Thermal shock to fish can result when summer thunderstorms fall on hot surfaces and wash into nearby streams.*

17. According to scientists, stormwater runoff has become the largest source of pollution in the Bays/Rivers/Streams. What exactly is storm water runoff pollution? (1 pts) Where do the pollutants come from? (*name at least 4* at 1 pt each) (5 pts total)

Sum of all pollutants that wash off land after rains and snowmelt

- *city streets*
- *farms/ag land*
- *pastures*
- *suburban parking lots*
- *lawns & gardens*
- *golf courses*

18. List 5 consequences of Urban Stormwater Runoff. (5 pts)

- *Flooding and property damage*
- *Streambed and streambank erosion*
- *Siltation and sedimentation*
- *Increased water temperature*
- *Harm to aquatic life*
- *Harm to coastal shellfish*
- *Harm to sportfishing industry*
- *Human illness*

Section IV. Aquatic Environments (Wetlands, Fish, Macroinvertebrates,)

19. Non-tidal wetlands are inland, freshwater areas not subject to tidal influence. They possess many of the same physical and biological characteristics as tidal wetlands. They perform similar ecological functions which are of value to humans. List 5 of these functions. (5 pts)

- *Fish and wildlife habitat*
- *Habitat for endangered/rare species*
- *Erosion control*
- *Water quality improvement*
- *Storm water/flood control*
- *Contribution of organic (plant) material to the food chain*
- *water reservoirs during dry periodsRecreational opportunities and scenic beauty*

20. Match the common name with the order name. (5 pts)

A.	Stonefly	__(c)___Odonata
B.	Midge	__(d)___Megaloptera
C.	Dragonfly	__(a)___Plecoptera
D.	Hellgrammite	__(b)___Diptera
E.	Caddisfly	__(e)___Trichoptera

21. Mayflies and stoneflies are considered indicators of water quality because they: (1 pt)
a. are tolerant of most types of pollution
b. require a high DO content in the water
c. can immediately change to a terrestrial form when an incident of pollution occurs
d. can withstand any change in pH

23. List four (4) factors that influence aquatic invertebrates in water and during hatch. (2 pts)

Light, season, temperature, pollution

24. Which fish species in not a member of the sunfish family centrarchidae? (1 pt)
a. striped bass
b. largemouth bass
c. bluegill
d. black crap

Identification

25. ID these fish to family (2 pts) and species (1 pts). You may use common or scientific names

    Fish #1 – *TBA*

    Fish #2 – *TBA*

26. Identify this wetland plant__*TBA*_____ (2 pts)

27. Identify specimens in the provided sample and list a key characteristic of each specimen. (10 pts). You may use common or scientific names

Specimen	Species	Key characteristic
1		
2		
3		
4		
5		

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Section V – Stream Assessment

28. Assess three physical stream characteristics and one chemical parameter within the marked area. Circle your findings. (8 pts)

    a. Embeddedness was: optimal suboptimal marginal poor

    b. Shelter for fish was: optimal suboptimal marginal poor

    c. Bank condition was: optimal suboptimal marginal poor

    d. Water hardness is _____mg/L. hard or soft

Total Points this page _____