

Science Olympiad Division B State Finals

Station 1

Sam enjoys watching the different species of wildlife that is attracted to the stream behind her parent's property. She notices over the last three weeks that there seems to be an unusually large amount of bullfrogs dead along the banks of the stream. Sam likes Bullfrogs and enjoys hearing them sing her to sleep every night. After some research, she has found out that there is a high percentage of the chemical pyraclostrobin in the water. She also finds out that pyraclostrobin is sold as the pesticide "Headline." "Headline" is used as a fungicide for a wide variety of crops and there is a soybean field next to her parent's property. After checking the label, Sam sees that soybeans are one of the crops listed for use on "Headlines" label.

1. Sam determines after checking with her neighbors that one week prior to seeing the dead Bullfrog that Farmer Jones, the owner of the Soybean Field sprayed the field with "Headline" six hours before a storm front came through. Sam determines with the information given that there are a couple of possible scenario's as to what happened to her frogs.
 - A. Seepage and percolation
 - B. Wind Drift and Seepage
 - C. Leeching and over mixing
 - D. Leeching and Wind Drift
2. Using the information in Scenario 1, Sam brings her best friend Chemika to the stream and Chemika notices that the King Fisher that lives by the steam appears sick and finding her nest, the eggs appear shattered. Chemika tells Sam that the reason the King Fisher is sick could be a result of:
 - A. Bioluminescence
 - B. Biomagnification
 - C. Bioaugmentation
 - D. Biostimulation
3. Pesticides
 - A. Kill Rodents
 - B. Kills Insects and Weeds
 - C. Is never sprayed over water
 - D. A and B
 - E. All of the above
4. This is an example of:
 - A. Erosion
 - B. Point Pollution
 - C. Non-Point Pollution
 - D. Diaqueous Percolation

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Station 2

5. Permits that limit the amount of pollutants discharged are required of all municipal and industrial wastewater dischargers under the _____ permit program.
 - a) Secondary Treatment Regulations
 - b) National Municipal Policy
 - c) Phase I Storm Water Rule
 - d) National Pollutant Discharge Elimination System (NPDES)

6. Several processes are typically part of preliminary treatment if present in a wastewater treatment plant. Which of the following processes (if present) would NOT typically be part of preliminary treatment?
 - a) phosphorus removal
 - b) grit removal
 - c) a comminuting process
 - d) bar screening

7. Another term for Effluent water is potable water. T/F

8. Density of a fluid can change with temperature fluctuations. T/F

9. Heavy Water is a natural by-product of wastewater. T / F

10. Disinfectants used for wastewater disinfection include all of the following EXCEPT:
 - a) ultraviolet radiation
 - b) chlorine
 - c) sulfur dioxide
 - d) ozone

11. A mound system is used as which component of an onsite wastewater treatment system?
 - a) the disinfection system
 - b) the management system
 - c) the soil dispersal component
 - d) The treatment unit

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Station 3

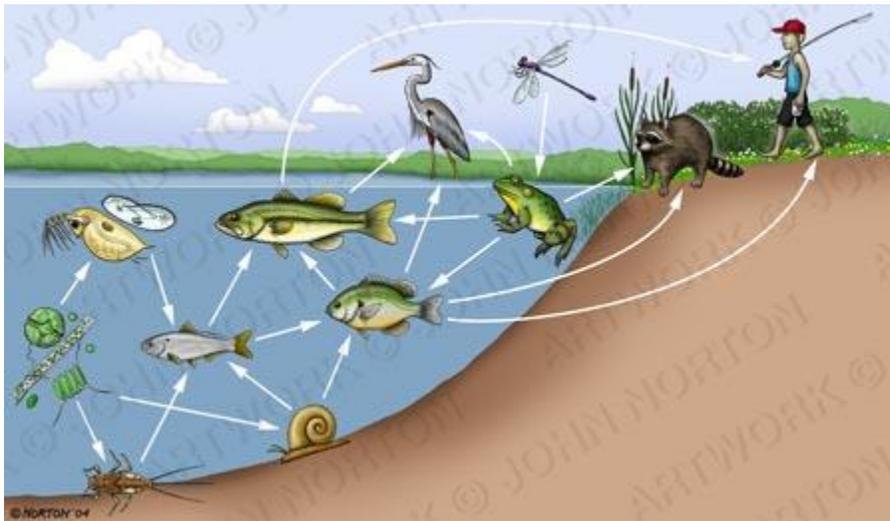
12. An area of land where water from rain and melting snow or ice drains downhill into a body of water, such as a river, lake, reservoir, wetland is called a:

- A. Watershed
- B. Aquifer
- C. Water Table
- D. None of the above

13. What is the following information an example of?

- **algae → mayflies → stoneflies → trout → humans**

- A. Food Web
- B. Food Chain
- C. An Animal Kingdom
- D. A phylum



14. The figure above is an example of a (an)

- A. Estuary
- B. Salt Marsh
- C. Soft Shoreline
- D. Food Web

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Station 4.

Rand and Min had been given an assignment in their AP Biology class to observe what was happening in the backyard of their friend Mat's house.

Their instructor gave them several different handouts with different parameters listed (see below). They were then told to find examples of each of the different parameters and match it to the correct level of Species Interactions.

A. Neutral, B. Commensalism, C. Mutualism, D. Parasitism, E. Predation

15. ____ A Blue Jays Nest/Tree

16. ____ A Dragon Fly/Mosquitoes

17. ____ Nematodes/ Tomatoes

18. ____ Ants / Aphids

19. ____ Frogs / Rabbits

20. Min noticed that over a period of two weeks, the Mosquito population had dropped to almost nonexistent levels while the Dragon Fly and Frog populations were thriving. Min remembered the lecture her instructor, Moiraine Merillan gave on Ecology of Communities specifically in dealing with competitive interactions. While writing in her daily journal, Min categorized this as an example of:

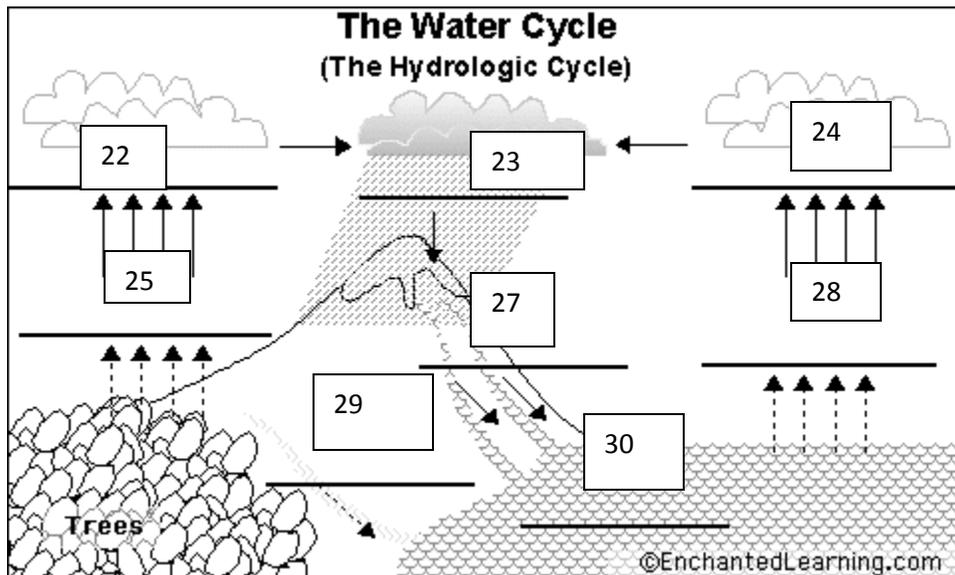
- A. Intraspecific Competition
- B. Interspecific Competition
- C. Dog eat Dog Competition
- D. Population Dynamics

21. Rand has had the same observations that Min had in the previous question. Rand wonders what will happen when all the Mosquitoes are gone. After mentioning this to Min she reminds him of the lecture and that this will be a great example of:

- A. Resource Partitioning
- B. Theory of Competitive Exclusion
- C. Population Divergence
- D. A Random Growth Habitat

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Station 5.



Using the Water Cycle Diagram above, match the correct term below with the correct number in the diagram above. The terms below may be used more than once.

- | | |
|----|---------------|
| A. | Accumulation |
| B. | Condensation |
| C. | Evaporation |
| D. | Precipitation |
| E. | Runoff |
| F. | Transpiration |

31. An estuary is a body of water where:

- A. a river begins
- B. the water runs very rapidly
- C. some irrigation is used
- D. freshwater meets saltwater

32. Water designated as "potable" means:

- A. it is safe to drink
- B. it can be moved from place to place
- C. it should be avoided not used for human consumption
- D. when mixed with potash, it becomes an unstable radioactive nucleotide

Science Olympiad Division B State Finals

Station 6.

33. You must wear your goggles while at this station. This station will test your ability to use your **homemade** hydrometer and how well your hydrometer is calibrated. You should be at a lab station that contains two 500-ml graduated cylinders. One cylinder contains distilled water and the other contains a saline solution with a salinity of 0% to 10%. Using your hydrometer, test the salinity of the saline solution. PLEASE rinse and wipe off your hydrometer between each use so that you do not cross-contaminate the solutions. Failure to do so may result in point deductions. Record your answer beside #33 on your answer sheet.

+/- 0.5% receives full credit (2.5 pts.)

+/- 0.6 to 1.0% receives partial credit (1.5 pts.)

+/- 1.1 to 2.0% receives partial credit (0.5 pt.)

+/- > 2.0% receives 0 credit (0 pt.)

If you finish before time is called. Relax for a moment but remain respectful of other groups.

Science Olympiad Division B State Finals

Station 7

Please Identify the following Nuisance Organisms

34.



35.



36.



37.



38.



39.



Science Olympiad Division B State Finals

Station 8

40. You must wear your goggles while at this station. This station will test your ability to use your **home-made** hydrometer and how well your hydrometer is calibrated. You should be at a lab station that contains two 500-ml graduated cylinders. One cylinder contains distilled water and the other contains a saline solution with a salinity of 0% to 10%. Using your hydrometer, test the salinity of the saline solution. PLEASE rinse and wipe off your hydrometer between each use so that you do not cross-contaminate the solutions. Failure to do so may result in point deductions. Record your answer beside #40 on your answer sheet.

+/- 0.5% receives full credit (2.5 pts.)

+/- 0.6 to 1.0% receives partial credit (1.5 pts.)

+/- 1.1 to 2.0% receives partial credit (0.5 pt.)

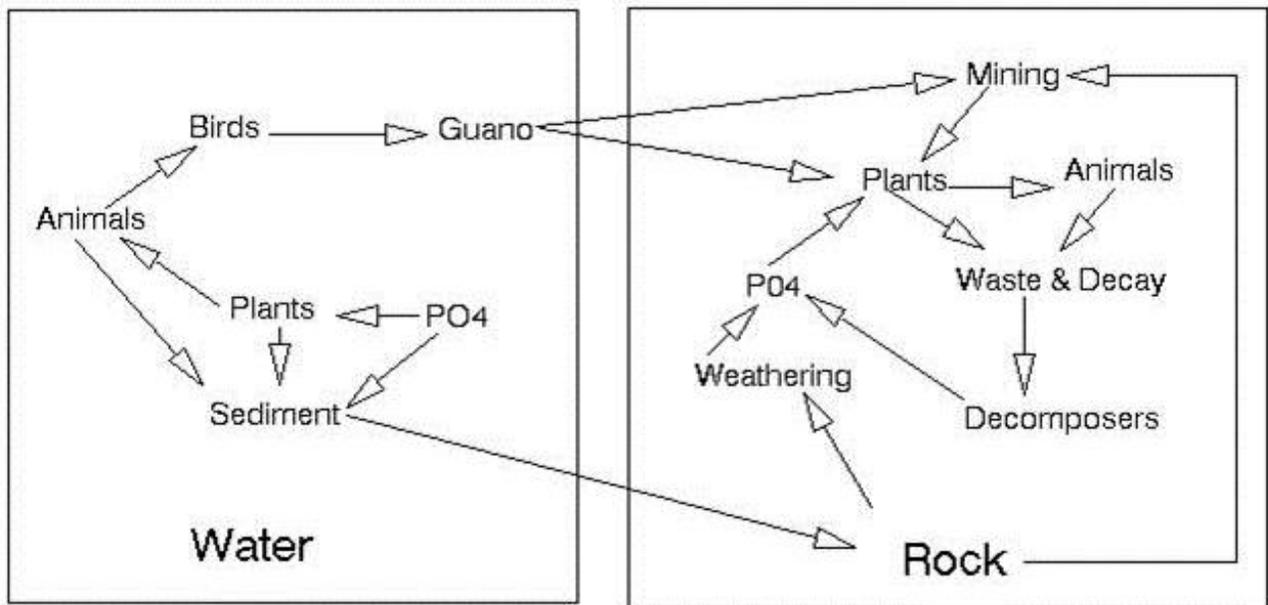
+/- > 2.0% receives 0 credit (0 pt.)

If you finish before time is called. Relax for a moment but remain respectful of other groups.

Science Olympiad Division B State Finals

Station 9

41. The number one source of pollution in North Carolina Waterways comes from?
 - A. Hog Farms
 - B. Municipal Waste Water Treatment Plants
 - C. Erosion and Sedimentation
 - D. Mining
42. Which of the following systems could be considered a Lentic System?
 - A. Pond
 - B. An Archaic Water Treatment System
 - C. Another name for Reverse Osmosis
 - D. A fast moving Creek
43. At a Waste Water Treatment Facility, Primary Treatment refers to:
 - A. Removal of Particles from the Waste Stream
 - B. Addition of Chlorine to begin disinfection
 - C. Formation of FLOC's
 - D. UV Disinfection
44. The figure listed below is an example of:



- A. Plants and Animal Decomposition Cycle
- B. The Carbon Cycle
- C. The Phosphorous Cycle
- D. The Circle of Life

Science Olympiad Division B State Finals

Station 10

Please Identify the following Macro invertebrates

45.



46.



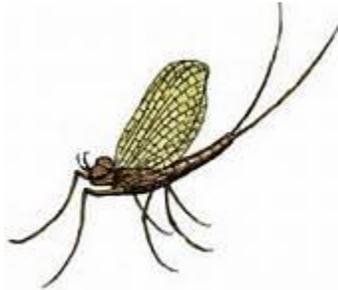
47.



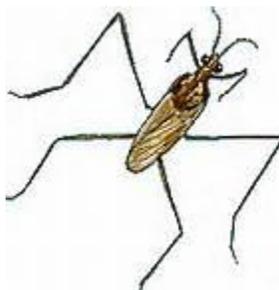
48.



49.



50.



Science Olympiad Division B State Finals

Station 11

51. Scientists measure the amount of salt in the water (salinity) in:

- A. ppt = parts per ton
- B. ppt = parts per thousand
- C. ppm = parts per million
- D. gpb = grains per bucket

52. If you found 3 ppm of D.O. when testing the water, which of the following did you find?

- A. 3 parts per million of dirty oxygen
- B. 3 parts per million of dissolved oxygen
- C. 3 parts per million of digested organisms
- D. 3 parts per micron of diluted oxides

Elayne noticed that there appeared to be water flowing down the street last Friday afternoon. There had not been any significant rainfall for the last 2 weeks. Following the trail of water to its source, she found that the local pep club was conducting a carwash to raise money for a trip to cheer on her Schools Science Olympiad team at the State Tournament. Elayne went and found the advisor and explained to him that the team should not be washing the cars where the water could get in the street and eventually the storm drains where the polluted water could end up in Riverrun Creek.

53. If Elayne wanted to prove to the Advisor that the water was polluted, which of the following test?

Would she not want to run?

- A. Nitrates
- B. Phosphates
- C. Biochemical Oxygen Demand
- D. Biological Oxygen Demand

54. How would you best describe the water flowing from the Carwash?

- A. Point Pollution
- B. Nonpoint Pollution
- C. Atrophic Pollution
- D. Entropic Pollution

55. As the temperature of a stream increases, the:

- a. dissolved oxygen (DO) increases
- b. DO decreases
- c. DO remains the same
- d. no direct correlation between temperature and DO

56. Why is coliform bacteria used as an indicator of poor water quality?

- a. indicates high O₂ levels
- b. indicates acid rain
- c. indicates fecal contamination
- d. indicates high phosphate levels

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Station 12

57. A water sample with a pH of 2.0 is considered to be
- A. Basic
 - B. Acidic
 - C. Neutral
 - D. Perfect for aquatic life
58. A secchi disk is used to measure
- A. The dissolved material in the water
 - B. Light penetration of a lake or pond
 - C. Flow of a stream or river
 - D. The depth of silt on the bottom of a lake
59. Which of the following is a non-point source of pollution to a river or stream?
- A. Industrial effluent
 - B. Sewage Effluent
 - C. Livestock grazing
 - D. Mining Effluent
60. If you ONLY find pollution-tolerant macro invertebrates in a stream, what does that indicate?
- A. The water quality of the stream has been degraded.
 - B. Fish ate all of the pollution-sensitive macro invertebrates.
 - C. You can drink the water.
 - D. You do not need to test any other parts of the stream.
61. Which statement best describes the water cycle?
- A. Rainfall infiltrates into the soil and moves downward to recharge groundwater, which then replenishes lakes, streams, and rivers.
 - B. Rain falls from the atmosphere into lakes and ponds on the surface of the Earth.
 - C. Water changes from liquid, gas, and solid forms as it is transferred on and within the Earth and atmosphere.
 - D. Solid water is stored in glaciers and ice caps

62. Look at the following food chain: Which creature will have the most toxins?

Walleye



Bluegill



Zooplankton



Phytoplankton

- A. walleye
- B. bluegill
- C. zooplankton
- D. phytoplankton

State Science Olympiad
Answer Sheet B Division

	Station 1		Station 8
1		40	
2			Station 9
3		41	
4		42	
	Station 2	43	
5		44	
6			Station 10
7		45	_____
8		46	_____
9		47	_____
10		48	_____
11		49	_____
	Station 3	50	_____
12			
13			Station 11
14		51	
	Station 4	52	
15		53	
16		54	
17		55	
18		56	
19			Station 12
20		57	
21		58	
	Station 5	59	
22		60	
23		61	
24		62	
25			
26	Free Point		
27			
28			
29			
30			
31			
32			
	Station 6		
33	_____		
	Station 7		
34	_____		
35	_____		
36	_____		
37	_____		
38	_____		
39	_____		

State Science Olympiad
Answer Sheet B Division

Station 1

- 1 D
- 2 B
- 3 D
- 4 C

Station 2

- 5 D
- 6 A
- 7 F
- 8 T
- 9 F
- 10 C
- 11 C

Station 3

- 12 A
- 13 B
- 14 D

Station 4

- 15 B
- 16 E
- 17 D
- 18 C
- 19 A
- 20 B
- 21 B

Station 5

- 22 B
- 23 D
- 24 B
- 25 F

Free Point

- 27 E
- 28 C
- 29 E
- 30 A
- 31 D
- 32 A

Station 6

33 _____

Station 7

- 34 Water Hyacinth
- 35 Cattail
- 36 Mosquito
- 37 Zebra Mussel
- 38 Carp
- 39 Purple Loosestrife

Station 8

40

Station 9

- 41 C
- 42 A
- 43 A
- 44 C

Station 10

- 45 Stone Fly
- 46 Water Boatman
- 47 Leech
- 48 Water Scorpion
- 49 May Fly
- 50 Water Strider

Station 11

- 51 C
- 52 B
- 53 D
- 54 A
- 55 B
- 56 C

Station 12

- 57 B
- 58 B
- 59 C
- 60 A
- 61 A
- 62 A