WATER QUALITY

Kansas City, Missouri • Regional Science Olympiad • 2013

For Competitors to Complete:

Competitor: _____ _____
First Name *Last Name*

Competitor: _____ _____
First Name *Last Name*

School: _____
Full School Name (No Abbreviations)

Team Number:_____ Division: *(Circle)* B (Middle School) C (High School)

For Event Supervisor to Complete:

Score Calculations:	Final Score:	**PLACE:**
Multiple Choice:_____		
Free Response: _____		
Raw Score: _____		
Tiebreakers: _____		
Deductions: _____		

Instructions for Competitors:

- Mark your name(s), school, team number, and division in the allotted area on the top of this page.
- The exam is divided into two sections: a Multiple Choice section and a Free Response section. You will have thirty (30) minutes to complete the Multiple Choice section and fifteen (15) minutes to complete the Free Response section. The two sections are in different test packets, but all of your answers will be recorded in this Answer Sheet.
- There are 35 multiple-choice questions (one point per question), and the essay is 15 points.
- An illegible response will be an incorrect response. Thus, write neatly. Mark all Multiple Choice responses with capital letters.
- The first tiebreaker is the score on the Free Response section of the exam. Following tiebreakers are pre-determined questions throughout the Multiple Choice section of the exam.
- On the exam, you are only allowed to use a 8.5 x 11 inch sheet of paper as reference, along with a calculator. Any other materials are prohibited. Using unauthorized aids on this exam will result in disqualification.
- The event supervisor has the right to deduct points at his/her discretion for poor behavior, rule breaking, cheating or for violating any Science Olympiad competition general rules and standards.

MULTIPLE CHOICE

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____ _____
20. _____ _____
21. _____ _____
22. _____ _____
23. _____ _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
31. _____
32. _____
33. _____
34. _____
35. _____

Use this area for scratch work or to draw pretty pictures.
Whatever is written/drawn in this area will not be graded.

FREE RESPONSE

WATER QUALITY

Kansas City, Missouri • Regional Science Olympiad • 2013

Multiple Choice

B

Instructions:

- Mark all of your answers in your Answer Sheet, not in this test packet. Use capital letters to mark your answers (*A* not *a*).
- Feel free to disconnect this test packet. You can also mark on this test packet as much you want to, but be sure all final answers are transferred to the Answer Sheet.
- Follow the directions marked within the exam for each question or group of questions.
- Do not begin until you are told to do so by the event supervisor.

Directions: *Unless otherwise stated, all questions in this exam are in a multiple-choice style. For each question, select the best answer from among the choices given and mark the appropriate corresponding letter on your Answer Sheet. Pay close attention to any provided figures, found alongside their corresponding question(s).*

1. When water hits soil, which of the following could happen to the water droplet?
   I. Condensation
   II. Infiltration
   III. Runoff

   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

2. Which of the following is **not** true of the difference between ponds and lakes?
   (F) Lakes experience waves while ponds do not.
   (G) Lakes are thermally stratified while ponds are not.
   (H) Light penetrates to the bottom of lakes but not ponds.
   (I) Both ponds and lakes have littoral and limnetic zones.
   (J) All of the above are true.

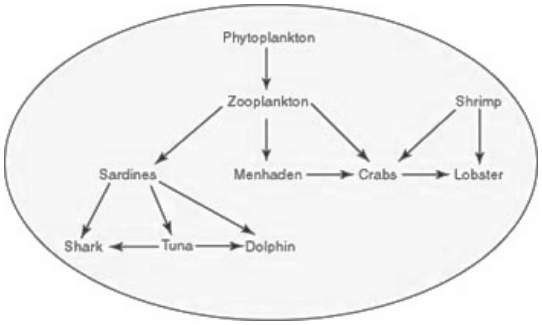
3. Which of the following zones is best described as "a place where the temperature is cold and oxygen is low"?
   (A) Littoral zone
   (B) Limnetic zone
   (C) Profundal zone
   (D) Eutrophic zone
   (E) Benthic zone

4. Which of the following wetland types is **not** matched with its proper description?
   (F) Basin wetland – Develops in shallow areas ranging from upland depressions to filled-in lakes and ponds
   (G) Fringe wetland – Found along costs of large lakes and seas
   (H) Marshes – Dominated by herbaceous vegetation
   (I) Swamps – Dominated by woody vegetation
   (J) All of the above are true.

5. While ___ are the driving force in a saltwater estuary, ___ are the driving force in a freshwater estuary.
   (A) Tides; Seiche waves
   (B) Seiche waves; Tides
   (C) Tides; Temperature changes
   (D) Water density changes; Seiche waves
   (E) Water density changes; Temperature changes

6. As shown in the map above, there is a large dead zone at the base of the Mississippi River ___. This dead zone is caused by ___ running off from the land and entering the Gulf of Mexico.
   (F) Watershed; Road salts and oils
   (G) Drainage basin; Nutrients and fertilizers
   (H) Watershed; Topsoil and sediment
   (I) Estuarine ecosystem; Acids and toxic metals
   (J) Watershed; Acids and toxic metals

7. Which of the following estuary habitats is **not** correctly matched with a fact about that habitat?
   (A) Kelp forests; Occur in cold, nutrient-rich waters of shallow, open coastal areas
   (B) Oyster reefs; Grow vigorously near river mouths and provide key habitats for breeding fish
   (C) Mudflats; Exposed at low tide and composed of extremely fine sediment
   (D) Salt marshes; Covered with trees and shrubs and exposed at low tide
   (E) All of the above are true.



8. In the food chain shown above, what organism listed below can be found in the fourth trophic level?
   (F) Zooplankton
   (G) Menhaden
   (H) Crabs
   (I) Phytoplankton
   (J) More than one of the above can be found in the fourth trophic level.

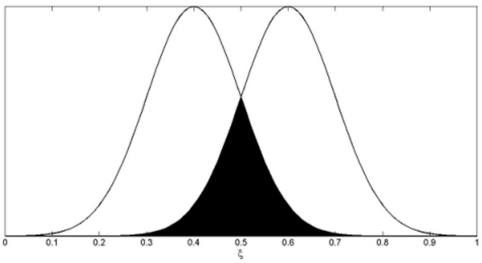
9. Which of the following properties of water allows a water strider to walk on top of the surface of a pond?
   (A) Density
   (B) Cohesion
   (C) Adhesion
   (D) Capillary action
   (E) Covalent bonding

10. Which of the following stages utilize microbes in waste-water treatment?
   I. Methane recovery
   II. Nutrient recycling
   III. Filtration and sedimentation

   (F) I only
   (G) II only
   (H) I and II only
   (I) I and III only
   (J) I, II and III

11. In the carbon cycle, which of the following processes contribute carbon dioxide to the atmosphere?
   I. Respiration
   II. Photosynthesis
   III. Volcanism

   (A) I only
   (B) II only
   (C) I and II only
   (D) I and III only
   (E) I, II and III only



12. In the diagram above, two niches overlap in the black area. Which of the following are possible outcomes from this overlap?
   (F) Resource partitioning and predation
   (G) Competitive exclusion and resource partitioning
   (H) Predation and intraspecific competition
   (I) Competitive exclusion and the application of the one-niche one-species principle
   (J) Resource partitioning, predation, competitive exclusion, intraspecific competition, and the application of the one-niche one-species principle

13. Which of the following is **not** an advantage of using macroinvertebrates as water quality indicators?
   (A) They are fairly immobile, so they act as the "captive audience" of a pollution event.
   (B) They are easy to identify and collect.
   (C) They have long life spans, so they can sometimes outlive pollution events.
   (D) They can be easily grouped into pollution tolerance classes for comparisons.
   (E) All of the above are true.

14. EPT Richness is:
   (F) The total number of mayfly, stonefly, and caddisfly taxa present within a water body.
   (G) The total abundance of Class 1 macroinvertebrates within a water body.
   (H) The ratio of macroinvertebrates within the orders Ephemeroptera, Plecoptera, and Tricoptera to the number of Class 1 macroinvertebrates within a water body.
   (I) The percent composition of Class 1 macroinvertebrates within a water body.
   (J) The total amount of money made by individual competitors in the European Poker Tour.

15. Which of the following macroinvertebrates exhibits complete metamorphosis?
   (A) Mayfly
   (B) Water scorpion
   (C) Damselfly
   (D) Caddisfly
   (E) Dragonfly

16. Which of the following is **not** true?
   (F) Silver carp; Can cause harm to boaters
   (G) Asian tiger mosquito; Can consume dead and decaying fish before natural decomposers come in
   (H) Green carp; Can consume submerged vegetation within a pond
   (I) Zebra mussel; Can grow on top of native mussels and prevent them from opening
   (J) All of the above are true.

17. How were zebra mussels introduced to the United States?
   (A) Accidently via escape and release from aquariums
   (B) Accidently via ballast water operations
   (C) Intentionally as food in ponds for native fish
   (D) Intentionally as a control of an existing invader
   (E) More than one of the above.

18. In a pond, the following taxa are found: mayfly (15 individuals), water penny (3 individuals), mosquito (2 individuals), blackfly (7 individuals), and dragonfly (9 individuals). What is the pollution tolerance index of the water body?
   (F) 10
   (G) 13
   (H) 36
   (I) 67
   (J) 113

Directions for Questions 19-23: *For each of the following questions, you will be given a figure representing a specific macroinvertebrate. Identify the macroinvertebrate and then mark the appropriate letter, corresponding to your identification choice, from the options below. Do NOT write the full common name on the Answer Sheet; you will receive no credit. Mark the appropriate letter, using the key below.*

In addition to marking the common name of the macroinvertebrate, mark the life stage of the macroinvertebrate on the second blank following the guide shown below:

A = Adult N = Nymph L = Larva P = Pupa I = Instar

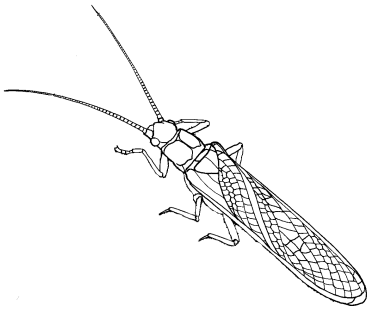
Questions 24-35 will continue in a multiple-choice style, following the instructions given on the top of Page 2.

QUESTIONS 19-23: Macroinvertebrate Letter Designation Key

Mark the appropriate English alphabet letter or Greek alphabet letter on your Answer Sheet.

(A) Mayfly	(G) Riffle Beetle	(M) Crane Fly	(S) Deer/Horse Fly	(Y) Giant Water Bug
(B) Stonefly	(H) Water Scorpion	(N) Water Mite	(T) Tubifex	(Z) Back Swimmer
(C) Caddisfly	(I) Aquatic Sowbug	(O) Blackfly	(U) Blood Midge	(θ) Midge
(D) Dobsonfly	(J) Damselfly	(P) Flatworm	(V) Whirligig Beetle	(π) Water Boatman
(E) Gilled Snail	(K) Dragonfly	(Q) Leech	(W) Water Strider	(Ω) Predacious Diving Beetle
(F) Water Penny	(L) Scud	(R) Air Breathing Snail	(X) Mosquito	

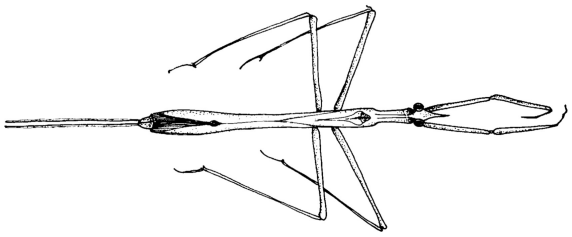
19. Identify the macroinvertebrate below.



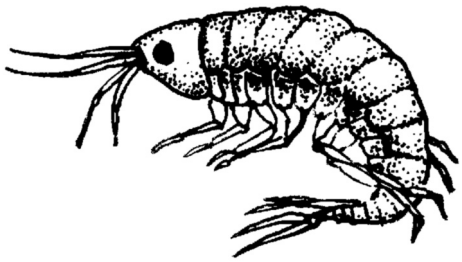
20. Identify the macroinvertebrate below.

21. Identify the macroinvertebrate below.

22. Identify the macroinvertebrate below.



23. Identify the macroinvertebrate below.



• • • •

24. Which of the following statements is **not** true?
    (A) As temperature increases, dissolved oxygen decreases.
    (B) As flow increases, dissolved oxygen increases.
    (C) Dissolved oxygen is highest at sunrise.
    (D) A pond on the top of Mt. Kilimanjaro has more dissolved oxygen than a pond at the base of the mountain.
    (E) All of the above are true.

25. On Day 1, the water sample from a pond has a pH of 7. On Day 5, the water sample from a pond has a pH of 5. Which of the following statements is true?
    (F) The pond is 100 times more basic on Day 5 than on Day 1.
    (G) The pond is 100 times more acidic on Day 5 than on Day 1.
    (H) The pond is 2 times more basic on Day 5 than on Day 1.
    (I) The pond is 2 times more acidic on Day 5 than on Day 1.
    (J) None of the above are true.

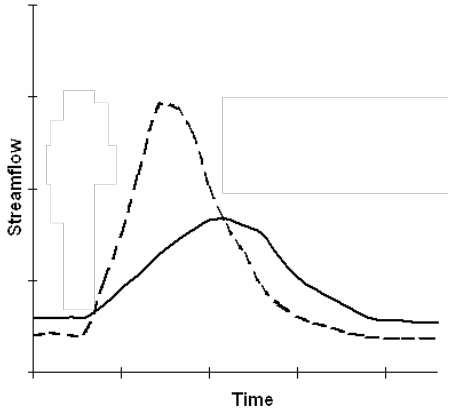
26. In which of the following conditions would biochemical oxygen demand be the highest?
    (A) A pond in the summer.
    (B) A first-order stream in the winter.
    (C) A lower-reach river in the winter.
    (D) A mid-reach stream in the fall.
    (E) A pond in the spring.

27. Which of the following is **not** a cause of having excess phosphates in a water body?
    (F) Increase in turbidity
    (G) Decrease in dissolved oxygen
    (H) Increase in temperature.
    (I) None of the above are possible causes.
    (J) All of the above are possible causes.

28. Which of the following, if added to a body of water, will **not** increase the dissolved solids?
    (A) Ammonia
    (B) Limestone
    (C) Detritus
    (D) Salt
    (E) All of the above increase dissolved solids.

29. A pond is located in the middle of an intensively grazed pastureland that fails to utilize sustainable grazing techniques (like the one pictured above). The pastureland contains tall fescue and holds cattle that are free to roam wherever they choose. Which of the following is **not** true of the pond within the pastureland?
    (F) The pond has high turbidity levels.
    (G) The pond has high fecal coliform levels.
    (H) The pond has high dissolved solids levels.
    (I) The pond has high temperature.
    (J) All of the above are true.

30. Which of the following could **not** lead to an increase in the fecal coliform count in a body of water?
    (A) Increase in temperature
    (B) Increase in nitrates and phosphates
    (C) Increase in pH
    (D) Increase in dissolved oxygen
    (E) All of the above could lead to an increase in fecal coliform.



31. The solid line in the hydrograph above represents stream flow three years ago. The dotted line in the hydrograph represents stream flow one month ago. Which of the following is most likely **not** true of the stream?
    (F) There is an increase in nitrates and phosphates.
    (G) There is an increase in turbidity.
    (H) There is an increase in dissolved oxygen.
    (I) There is an increase in salinity.
    (J) All of the above are true.

32. Which of the following containers will have the highest conductivity?
    I. A container with an aqueous sugar solution.
    II. A container with an aqueous salt solution.
    III. A container with a low pH.

    (A) I only
    (B) II only
    (C) I and III only
    (D) II and III only
    (E) I, II and III

33. You lower a white object into a lake and measure the depth at which the object is no longer visible. What water quality test are you testing for?
    (F) Nitrates
    (G) Turbidity
    (H) Dissolved oxygen
    (I) Total solids
    (J) None of the above.

34. Which of the following is **not** a possible effect of high turbidity?
    (A) Loss of benthic habitats
    (B) Decrease in visibility for site-feeding fish
    (C) Increase in biochemical oxygen demand
    (D) Decrease in pH
    (E) All of the above are possible effects.

Directions for Question 35: *Use your hydrometer to answer #35. Write your measurement directly on the answer sheet.*

35. Determine the percent salinity of the solution in the container at the front of the room. Write your answer, as a percent, on the answer sheet.

WATER QUALITY

Kansas City, Missouri • Regional Science Olympiad • 2013

Multiple Choice

C

Instructions:

- Mark all of your answers in your Answer Sheet, not in this test packet. Use capital letters to mark your answers (*A* not *a*).
- Feel free to disconnect this test packet. You can also mark on this test packet as much you want to, but be sure all final answers are transferred to the Answer Sheet.
- Follow the directions marked within the exam for each question or group of questions.
- Do not begin until you are told to do so by the event supervisor.

Directions: *Unless otherwise stated, all questions in this exam are in a multiple-choice style. For each question, select the best answer from among the choices given and mark the appropriate corresponding letter on your Answer Sheet. Pay close attention to any provided figures, found alongside their corresponding question(s).*

1. When water hits soil, which of the following could happen to the water droplet?
   I. Condensation
   II. Infiltration
   III. Runoff

   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

2. Which of the following is **not** true of the difference between ponds and lakes?
   (F) Lakes experience waves while ponds do not.
   (G) Lakes are thermally stratified while ponds are not.
   (H) Light penetrates to the bottom of lakes but not ponds.
   (I) Both ponds and lakes have littoral and limnetic zones.
   (J) All of the above are true.

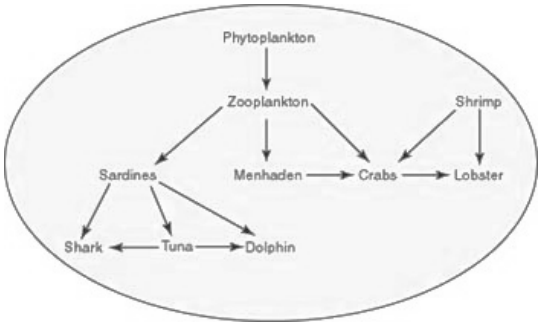
3. Which of the following zones is best described as "a place where the temperature is cold and oxygen is low"?
   (A) Littoral zone
   (B) Limnetic zone
   (C) Profundal zone
   (D) Eutrophic zone
   (E) Benthic zone

4. Which of the following wetland types is **not** matched with its proper description?
   (F) Basin wetland – Develops in shallow areas ranging from upland depressions to filled-in lakes and ponds
   (G) Fringe wetland – Found along costs of large lakes and seas
   (H) Marshes – Dominated by herbaceous vegetation
   (I) Swamps – Dominated by woody vegetation
   (J) All of the above are true.

5. While ___ are the driving force in a saltwater estuary, ___ are the driving force in a freshwater estuary.
   (A) Tides; Seiche waves
   (B) Seiche waves; Tides
   (C) Tides; Temperature changes
   (D) Water density changes; Seiche waves
   (E) Water density changes; Temperature changes

6. As shown in the map above, there is a large dead zone at the base of the Mississippi River ___. This dead zone is caused by ___ running off from the land and entering the Gulf of Mexico.
   (F) Watershed; Road salts and oils
   (G) Drainage basin; Nutrients and fertilizers
   (H) Watershed; Topsoil and sediment
   (I) Estuarine ecosystem; Acids and toxic metals
   (J) Watershed; Acids and toxic metals

7. Which of the following estuary habitats is **not** correctly matched with a fact about that habitat?
   (A) Kelp forests; Occur in cold, nutrient-rich waters of shallow, open coastal areas
   (B) Oyster reefs; Grow vigorously near river mouths and provide key habitats for breeding fish
   (C) Mudflats; Exposed at low tide and composed of extremely fine sediment
   (D) Salt marshes; Covered with trees and shrubs and exposed at low tide
   (E) All of the above are true.



8. In the food chain shown above, what organism listed below can be found in the fourth trophic level?
   (F) Zooplankton
   (G) Menhaden
   (H) Crabs
   (I) Phytoplankton
   (J) More than one of the above can be found in the fourth trophic level.

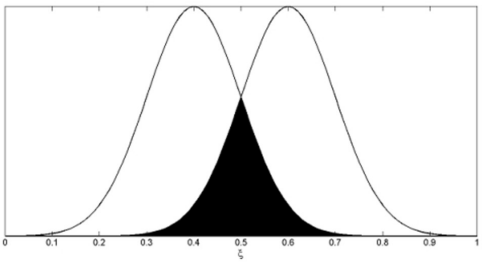
9. Which of the following properties of water allows a water strider to walk on top of the surface of a pond?
   (A) Density
   (B) Cohesion
   (C) Adhesion
   (D) Capillary action
   (E) Covalent bonding

10. Which of the following stages utilize microbes in waste-water treatment?
   I. Methane recovery
   II. Nutrient recycling
   III. Filtration and sedimentation

   (F) I only
   (G) II only
   (H) I and II only
   (I) I and III only
   (J) I, II and III

11. In the carbon cycle, which of the following processes contribute carbon dioxide to the atmosphere?
   I. Respiration
   II. Photosynthesis
   III. Volcanism

   (A) I only
   (B) II only
   (C) I and II only
   (D) I and III only
   (E) I, II and III only



12. In the diagram above, two niches overlap in the black area. Which of the following are possible outcomes from this overlap?
   (F) Resource partitioning and predation
   (G) Competitive exclusion and resource partitioning
   (H) Predation and intraspecific competition
   (I) Competitive exclusion and the application of the one-niche one-species principle
   (J) Resource partitioning, predation, competitive exclusion, intraspecific competition, and the application of the one-niche one-species principle

13. EPT Richness is:
   (A) The total number of mayfly, stonefly, and caddisfly taxa present within a water body.
   (B) The total abundance of Class 1 macroinvertebrates within a water body.
   (C) The ratio of macroinvertebrates with the orders Ephemeroptera, Plecoptera, and Tricoptera to the number of Class 1 macroinvertebrates within a water body.
   (D) The percent composition of Class 1 macroinvertebrates within a water body.
   (E) The total amount of money made by individual competitors in the European Poker Tour.

14. Which of the following is **not** true?
   (F) Silver carp; Can cause harm to boaters
   (G) Asian tiger mosquito; Can consume dead and decaying fish before natural decomposers come in
   (H) Green carp; Can consume submerged vegetation within a pond
   (I) Zebra mussel; Can grow on top of native mussels and prevent them from opening
   (J) All of the above are true.

15. How were zebra mussels introduced to the United States?
   (A) Accidently via escape and release from aquariums
   (B) Accidently via ballast water operations
   (C) Intentionally as food in ponds for native fish
   (D) Intentionally as a control of an existing invader
   (E) More than one of the above.

• CONTINUED ON THE NEXT PAGE •

Directions for Questions 16-23: *For each of the following questions, you will be given a figure representing a specific macroinvertebrate or a description of a macroinvertebrate. Identify the macroinvertebrate and then mark the appropriate letter, corresponding to your identification choice, from the options below. Do NOT write the full common name on the Answer Sheet; you will receive no credit. Mark the appropriate letter, using the key below.*

Directions for Questions 19-23: *In addition to marking the common name of the macroinvertebrate, mark the life stage of the macroinvertebrate on the second blank following the guide shown below:*

A = Adult N = Nymph L = Larva P = Pupa I = Instar

Questions 24-35 will continue in a multiple-choice style, following the instructions given on the top of Page 2.

QUESTIONS 16-23: Macroinvertebrate Letter Designation Key

Mark the appropriate English alphabet letter or Greek alphabet letter on your Answer Sheet.

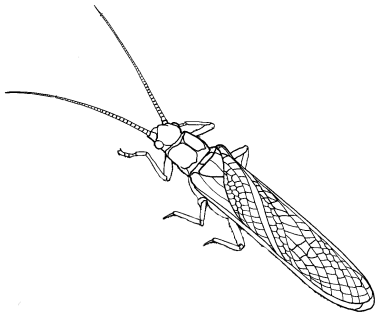
(A) Mayfly	(G) Riffle Beetle	(M) Crane Fly	(S) Deer/Horse Fly	(Y) Giant Water Bug
(B) Stonefly	(H) Water Scorpion	(N) Water Mite	(T) Tubifex	(Z) Back Swimmer
(C) Caddisfly	(I) Aquatic Sowbug	(O) Blackfly	(U) Blood Midge	(θ) Midge
(D) Dobsonfly	(J) Damselfly	(P) Flatworm	(V) Whirligig Beetle	(π) Water Boatman
(E) Gilled Snail	(K) Dragonfly	(Q) Leech	(W) Water Strider	(Ω) Predacious Diving Beetle
(F) Water Penny	(L) Scud	(R) Air Breathing Snail	(X) Mosquito	

16. This macroinvertebrate is a scraper as a larva. The larva can stick flat onto rocks or other hard substrates and eat debris, such as algae and diatoms. The adult is not aquatic. This macroinvertebrate is intolerant of pollution.

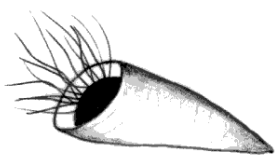
17. This macroinvertebrate exhibits complete metamorphosis and spends its entirely life either in or on the water. They are typically found in lentic ecosystems, and the adults could be described as "bullets zipping on the water's surface."

18. The adult females of this macroinvertebrate can transmit blood and skin parasites between mammals. The immatures are filtering collectors and can attach onto rocks or hard surfaces and filter. This macroinvertebrate exhibits complete metamorphosis.

19. Identify the macroinvertebrate below.

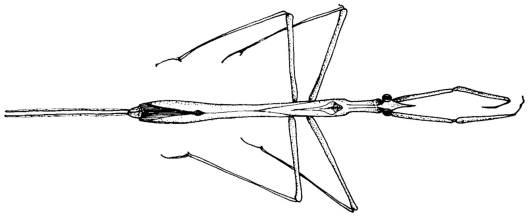


20. Identify the macroinvertebrate below.

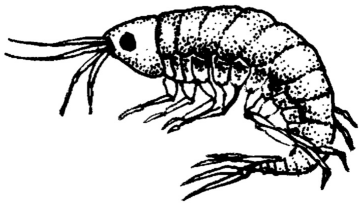


21. Identify the macroinvertebrate below.

22. Identify the macroinvertebrate below.



23. Identify the macroinvertebrate below.



• • • •

24. Which of the following statements is **not** true?
    (A) As temperature increases, dissolved oxygen decreases.
    (B) As flow increases, dissolved oxygen increases.
    (C) Dissolved oxygen is highest at sunrise.
    (D) A pond on the top of Mt. Kilimanjaro has more dissolved oxygen than a pond at the base of the mountain.
    (E) All of the above are true.

25. Alkaline compounds in the water, such as carbonates:
    (F) Can create a more acidic water body.
    (G) Can remove excess hydrogen ions from the water.
    (H) Can be measured for using colorimetry.
    (I) Can be poisonous to pollution intolerant macroinvertebrates.
    (J) None of the above are true.

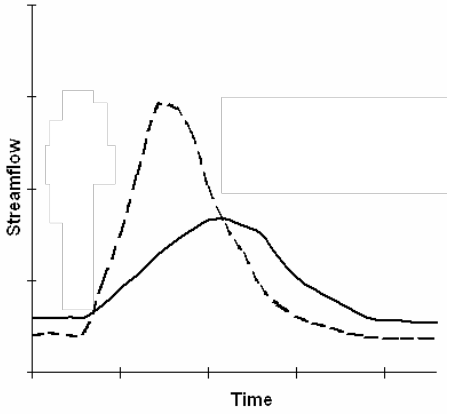
26. In which of the following conditions would biochemical oxygen demand be the highest?
    (A) A pond in the summer.
    (B) A first-order stream in the winter.
    (C) A lower-reach river in the winter.
    (D) A mid-reach stream in the fall.
    (E) A pond in the spring.

27. Which of the following is a potential source of phosphates but not nitrates?
    (F) Fertilizers from farms or lawns
    (G) Bat and bird guano
    (H) Waste water and fecal sources
    (I) Some types of rocks
    (J) All of the above are possible sources of both nitrates and phosphates.

28. Which of the following, if added to a body of water, will **not** increase the turbidity?
    (A) Soil
    (B) Algae
    (C) Detritus
    (D) Salt
    (E) All of the above increase turbidity.

29. A pond is located in the middle of an intensively grazed pastureland that fails to utilize sustainable grazing techniques (like the one pictured above). The pastureland contains tall fescue and holds cattle that are free to roam wherever they choose. Which of the following is **not** true of the pond within the pastureland?
    (F) The pond has high turbidity levels.
    (G) The pond has high fecal coliform levels.
    (H) The pond has high dissolved solids levels.
    (I) The pond has high temperature.
    (J) All of the above are true.

30. Which of the following could **not** lead to an increase in the fecal coliform count in a body of water?
    (A) Increase in temperature
    (B) Increase in nitrates and phosphates
    (C) Increase in pH
    (D) Increase in dissolved oxygen
    (E) All of the above could lead to an increase in fecal coliform.



31. The solid line in the hydrograph above represents stream flow three years ago. The dotted line in the hydrograph represents stream flow one month ago. Which of the following is most likely **not** true of the stream?
    (F) There is an increase in nitrates and phosphates.
    (G) There is an increase in turbidity.
    (H) There is an increase in dissolved oxygen.
    (I) There is an increase in salinity.
    (J) All of the above are true.

32. Which of the following containers will have the highest conductivity?
    I. A container with an aqueous sugar solution.
    II. A container with an aqueous salt solution.
    III. A container with a low pH.

    (A) I only
    (B) II only
    (C) I and III only
    (D) II and III only
    (E) I, II and III

33. You go out to conduct a water quality test with a titration tube, a manganous sulfate solution, starch indicator solution, and some other chemicals. What water quality test are you going out to conduct?
    (F) Nitrates
    (G) Phosphates
    (H) Dissolved oxygen
    (I) pH
    (J) None of the above.

34. Which of the following is **not** a possible effect of high turbidity?
    (A) Loss of benthic habitats
    (B) Decrease in visibility for site-feeding fish
    (C) Increase in biochemical oxygen demand
    (D) Decrease in pH
    (E) All of the above are possible effects.

Directions: *Use your hydrometer to answer #35. Write your measurement directly on the answer sheet.*

35. Determine the percent salinity of the solution in the container at the front of the room. Write your answer, as a percent, on the answer sheet.

WATER QUALITY

Kansas City, Missouri • Regional Science Olympiad • 2013

Free Response

B/C

Instructions:

- Write your essay in the Answer Sheet. Feel free to make markings inside of this packet, but be sure the final essay is in the Answer Sheet.
- Use complete sentences and follow Standard Written English procedures and rules for spelling and grammar.
- On your Answer Sheet, when answering a part of the Free Response question, mark the appropriate letter (a, b, etc.) of that part on your Answer Sheet next to your response.
- Do not begin until you are told to do so by the event supervisor.

FREE RESPONSE: DOCUMENT BASED QUESTION

15 points

Scenario:

You are a part of the Missouri Stream Team initiative, and, as a part of this initiative, you are working to survey particular streams around the state of Missouri. You have been assigned to the Saxby Stream. For your survey, you have gained extensive amounts of information regarding the health of the stream at two different points: Site 1 and Site 2. All of your findings are contained within this packet. Each finding (henceforth "Source") has a brief description and then its information. When composing your final survey report (i.e. answering the questions below), be sure to reference specific Sources. If you fail to reference specific Sources, you will lose one point from your Free Response score.

In order to compose your stream survey of Saxby Stream in alignment with Missouri Stream Team standards, answer the questions below.

Questions:

A. What do the macroinvertebrates present indicate about the health of each site and the in-stream habitat at each site? How would the information given in Source 2 affect the information given in Source 3?
(3 points)

B. Your survey team also measured for dissolved oxygen, turbidity, temperature and biochemical oxygen demand. For each parameter, give the Site (either Site 1 or Site 2) at which the measurement for that specific parameter would be higher (compared to the other site). What does this information say about overall stream health?
(4 points)

C. What is most likely happening between Site 1 and Site 2? What watershed activity could be causing the changes within the stream? How can you tell? Provide a reasonable hypothesis, using the information from the Sources, to explain what could be happening between the two sites.
(5 points)

D. Give one conservation practice that could be implemented within the Saxby Stream watershed to prevent the continued degradation of the health of the stream. Explain how this conservation practice will improve the health of the stream.
(3 points)

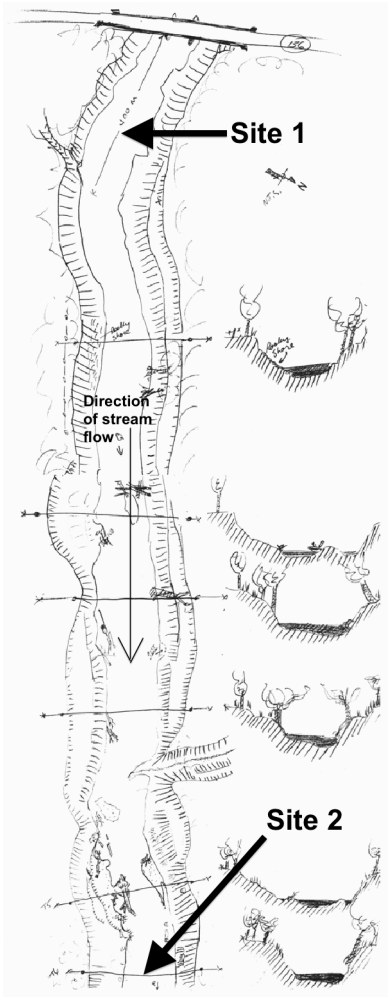
Planning space:

Use the blank space below for any planning or scratch work, as needed. Anything written below will not be graded.

Sources:
There are **five** total sources: one map, two tables, one graph, and one newspaper clipping.

Source 1

This source is a map of Saxby Stream. On this map, the two sites are labeled along with the direction of stream flow and various cross sectional profiles between the two sites. Site 2 is about 1.5 kilometers away from Site 1.



Source 2

This source is a data table comparing the physical characteristics of the two sites.

	SITE 1	SITE 2
Width of riparian zone	50-100’	0-25’
Sinuosity	Straight	Straight
Bank stability	Intact	Collapsed in some areas
Woody and organic debris	Abundant	Sparse
Overhanging vegetation	Moderate	Moderate
Bank steepness	~25^{o}	~50^{o}
Substrate composition	Mostly cobble and gravel	Mostly sand and silt
Embeddedness	40%	85%

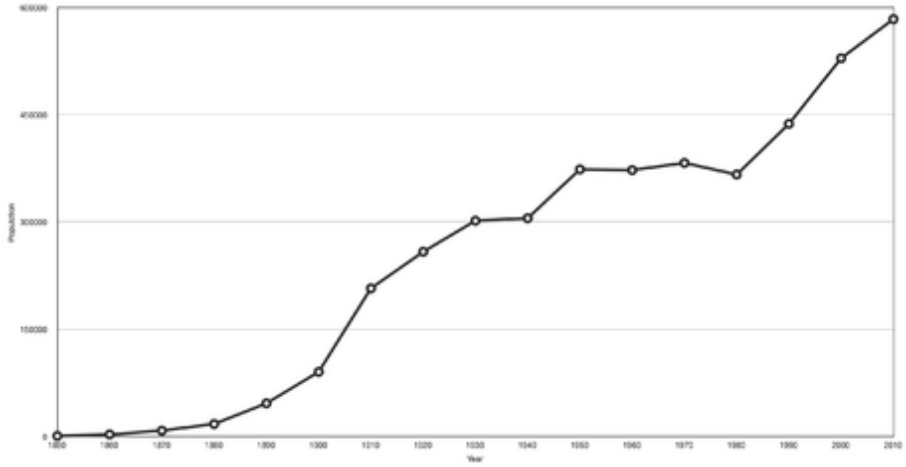
Source 3

This source is a data table comparing the macroinvertebrates found at the two sites.

SITE 1	SITE 2
Stonefly nymphs	Midges
Dragonfly nymphs	Aquatic sowbugs
Cranefly larvae	Air breathing snails
Blood midges	Flatworms
Riffle beetle larvae	Blackfly larvae

Source 4

This source is a chart showing the change in population over time in the Saxby Stream watershed. The x-axis gives years and the y-axis gives population size.



Source 5

This source is a newspaper clipping from the Harrisburg Herald*, located within the Saxby Stream watershed, on June 14, 2010.*

Number of Salmon in Saxby Decreases

A study, recently released by Salmon Unlimited, shows a trend of decreasing salmon spawning within the Saxby Stream. Head scientist Sue Wright says: "The decline is truly unfortunate, and we are currently working with legislators to pass stringent fishing regulations until the population is stable." Currently, scientists are unsure of the specific cause of the decrease in salmon, but the sudden immigration of people into the naturalistic and beautiful area of the Saxby Stream watershed might be related to the decline in some way. *Continued on Page 4A*

• END OF SOURCES •