ANSWER KEY

Team/School Name_____
Student Name(s)_____

REGIONAL SCIENCE OLYMPIAD
WATER QUALITY
March 3, 2001

University of Colorado at Colorado Springs (UCCS)

PLEASE PUT ALL ANSWERS DIRECTLY ON ANSWER SHEET!

Part I. Multiple Choice: Circle the <u>one</u> correct answer for each question.

1. Why is coliform bacteria used as an indicator of poor water quality?
   a. indicates high O_2 levels
   b. indicates acid rain
   c. indicates fecal contamination
   d. indicates high phosphate levels

2. Which substance is often the "growth-limiting" factor for aquatic plants?
   a. nitrogen
   b. silica
   c. oxygen
   d. phosphorus

3. Where should O_2 samples be taken in a stream?
   a. surface
   b. middle
   c. bottom
   d. doesn't make a difference, O_2 levels are uniform throughout depths

4. What causes salination of the soil?
   a. use of pesticides
   b. dissolved salts in irrigation water
   c. salt domes
   d. saltwater intrusion

5. The leading water born disease in the U.S. is:
   a. gastroenteritis
   b. Giardia
   c. Typhoid fever
   d. salmonella

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6. When the piezometric surface of water is above the ground surface, you have the following condition:
   a. artesian
   b. normal
   c. aquatic
   d. restricted
   e. none of the above

7. The water quality index (WQI) is used to evaluate and compare waters around the world. Which of the nine tests is weighted the highest?
   a. phosphates
   b. pH
   c. O_2
   d. Nitrates

8. The alkalinity of a water sample may be defined as the:
   a. capacity of a water sample to react with and neutralize acid
   b. capacity of a water sample to become toxic
   c. ability of a water sample to carry nutrients to plants and animals
   d. ability of a water sample to evaporate at low temperatures

9. The term water hardness is used to describe the concentrations of:
   a. sodium and potassium
   b. zinc and lead
   c. lead and calcium
   d. calcium and magnesium

10. Which of the following statements is <u>not</u> true?
    a. bacteria cannot reproduce without moisture
    b. water contains sufficient nutrients to support certain bacterial growths
    c. bacteria need a temperature of 32°C to 212°C to survive
    d. some bacteria can be cultured in media given the right environmental conditions

11. The Langelier Index is the measure of:
    a. corrosiveness of the water
    b. conductivity of the water
    c. metal concentration of the water
    d. potability of the water
    e. none of the above

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12. Water in the bottom of frozen lakes will be:
    a. –4.0°C
    b. 0.0°C
    c. 4.0°C
    d. 10.0°C
    e. 32.0°C

13. 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

14. Water alkalinity is a measure of:
    a. the acid neutralizing capacity of a particular body of water
    b. the H^+ concentration in a water sample
    c. the COD/BOD ion concentration in a water sample
    d. the ability of water to buffer sudden pH changes

15. The capacity for transmitting fluids is known as:
    a. permeability
    b. fluid flow
    c. porosity
    d. transferability
    e. none of the above

16. The free chlorine residual in water is:
    a. the amount of chlorides in the water
    b. the amount of chloramines in the water
    c. the amount of chlorine in the supply as it comes from the stream, reservoir, or well
    d. the amount of chlorine applied as measured in milligrams per liter
    e. the amount of uncombined chlorine that remains in the water after chlorine demand has been met

17. Prepared water sample bottles used for collecting samples for bacteriological examination contain sodium thiosulfate. It is important not to rinse out the sample bottles because the sodium thiosulfate:
    a. kills pathogens that may be present in the sample
    b. eliminates the need for refrigerating the sample
    c. neutralizes any chlorine in the sample
    d. holds the pH at a constant value
    e. none of the above

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18. The pH of healthy ponds and streams is approximately:
    a. 4.0
    b. 5.0
    c. 6.5
    d. 8.0
    e. 9.5

19. Hard water is:
    a. detrimental to wildlife
    b. a soap and detergent strengthener
    c. beneficial for wildlife
    d. rare in nature

20. Temperature inversions of lakes and ponds occur in:
    a. the summer only
    b. the spring and fall
    c. the spring only
    d. the winter only
    e. the summer and winter

TIE-BREAKER QUESTIONS:

21. What percentage of the world's diseases can be attributed to poor water quality?
    a. 30%
    b. 50%
    c. 80%
    d. 90%

22. A secchi disk is used to measure:
    a. light penetration of a lake or pond
    b. flow of a stream or river
    c. pH of any body of water
    d. the depth of silt on the bottom of a body of water

23. Which of the following are exotic species to U.S. water systems?
    a. parrot feather weed and Corbicula
    b. walking catfish and zebra mussel
    c. grass carp and nutria
    d. Hydrilla and water hyacinth

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Part II. Short Answer.

1. A group of students conducted a physical survey of a local river and noted that the undersides of rocks on the river bottom were black. What does this color indicate?

   Indicates anoxic conditions in the sediment

2. Farm or street run-off are examples of what kind of pollution?

   non-point

3. Water is the universal solvent. How does this property help explain water pollution?

   dissolves most substances

4. What element leaches out of soil due to acid rain forming compounds lethal to gilled animals?

   aluminum (Al)

5. What group of organisms dominate waters at all pH levels?

   bacteria

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Part III. Macroinvertebrate Indentification. Give the common name for each organism shown.

1. Mayfly nymph
2. Caddisfly larvae
3. Dragonfly nymph
4. Scud
5. Dobsonfly larvae
6. Blackfly larvae
7. Blood Midge
8. Crane Fly larvae
9. Flatworm
10. Leech

Calculate the cumulative pollution tolerance index for the above organisms. Use the values below to help, if needed. Full credit will not be given unless work is shown.

Class 1 (pollution sensitive)	Class 2 (moderately sensitive)	Class 3 (moderately tolerant)	Class 4 (pollution tolerant)
Index Value = 4	Index Value = 3	Index Value = 2	Index Value = 1

Cumulative pollution tolerance index value: 28

Index Values for above organisms:

1. 4
2. 4
3. 3
4. 3
5. 4
6. 2
7. 1
8. 3
9. 2
10. 2

Work: (4 X 3) + (3 X 3) + (2 X 3) + (1 X 1) = 28

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Part IV. Chemical Analysis of Water.

pH _____

Turbidity _____

Phosphate _____

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