

- 3 stations with 15 minutes each
  - multiple choice/short answer exam
  - have bonus questions from each section
  - each section 33% of total**
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## Station 1: General Water Quality

- WRITTEN EXAM
  - water cycle
  - aquatic chemistry
  - potable water treatment
  - WWTP treatment
  - sedimentation pollution
  - invasive species—i.e. Zebra mussel—Scott
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**(1 point)** 1) Briefly define the term “watershed”.

**Answer:** An area of land from which water drains into a given point, usually a larger body of water

**(1 point)** 2) Briefly define the term “point source”.

**Answer:** Consists of pollutions, which originate from a clearly identifiable source and move through a conduit, such as a factory discharge pipe

**(1 point)** 3) Briefly define the term “nonpoint source”.

**Answer:** Runoff from the land which may contain pesticides, fertilizers, metals, manure, road salt and other pollutants

**(7 points)** 4) Match the definitions with the terms in the word bank below. Record the letter of the term on the blank preceding the statement.

\_\_A\_\_ a. The change of water from a gas to a liquid

\_\_D\_\_ b. The process in which water becomes a vapor in the atmosphere

\_\_E\_\_ c. The method in which water continually moves from the earth to the atmosphere and back again

\_\_B\_\_ d. A resource needed by all the living things in an ecosystem

\_\_C\_\_ e. The gaseous state of water

\_\_F\_\_ f. The forms of condensed water vapor such as snow, rain or sleet

\_\_G\_\_ g. Water stored in the ground

Word Bank:

- A. condensation
- B. water
- C. water vapor
- D. evaporation
- E. water cycle
- F. precipitation
- G. groundwater

**(1 point)** 5) Define the term “invasive species”.

**Answer:** Species that evolved elsewhere, and have been purposely or accidentally relocated. These species often find no natural enemies in their new habitat, and therefore spread easily and quickly.

**(1 point)** 6) To what region are Zebra mussels native?

**Answer:** Caspian Sea region of Asia

**(1 point)** 7) What process may be defined as the wearing away of the earth’s surface by running water, wind, ice, or other geological agents, processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is removed from the earth’s surface?

**Answer:** Erosion

**(1 point)** 8) (True/False) Contour and terracing are two farming methods that may be used to prevent erosion.

**Answer:** True

# Station 2: Macroinvertebrate Station

-ID MACROS

-only common names

-importance as indicators of water quality

-determine water quality by calculating cumulative pollution tolerance index

-what's the index value for air breathers?

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## A. Identify the following macroinvertebrates (common names only).

1. Mayfly nymph
2. Caddisfly nymph
3. Stonefly nymph
4. Dobsonfly larvae
5. Damselfly nymph
6. Dragonfly nymph
7. Scud
8. Crane fly larvae
9. Midge larvae
10. Blackfly larvae
11. Snail
12. Maggot
13. Whirligig beetle
14. Water strider
15. Mosquito larvae
16. Giant water bug

**B. Determine water quality of each stream by calculating the cumulative pollution tolerance index from the macroinvertebrates found here.**

Example: If 2 different kinds are found in class 1 ( $2 \times 4=8$ ) + 1 in class 2 ( $1 \times 3$ ) + 2 in class 3 ( $2 \times 2=4$ ) +3 in class 4 ( $3 \times 1=3$ ) for a total of 18 would indicate good water quality based on the following tolerance index:

**Tolerance Index:** Excellent = 23; Good = 17 – 22; Fair = 11 – 16; Poor – 10 or less

**Class 1 (pollution sensitive)**

**Index Value=4**

*Mayfly nymph*

*Caddisfly larvae*

*Stonefly larvae*

*Dobsonfly larvae*

*Gilled Snails*

*Water penny larvae*

*Gilled snails*

*Riffle Beetle larvae*

**Class 2 (moderately sensitive)**

**Index Value=3**

*Aquatic sowbug*

*Damselfly nymph*

*Dragonfly nymph*

*Scuds*

*Crane fly larvae*

**Class 3 (moderately tolerant)**

**Index Value=2**

*Water mite*

*Midge larvae*

*Blackfly larvae*

*Flatworm*

*Leeches*

**Class 4 (pollution tolerant)**

**Index Value=1**

*Air breathing snail*

*Maggot*

*Tubifex*

*Blood midge*

**(6 points)** 1) Would you rate Stream A as excellent, good, poor or fair? Fair

**(6 points)** 2) Would you rate Stream B as excellent, good, poor or fair? Good

Stream A:

1 dobsonfly nymph (4)  
1 crane fly nymph (3)  
1 scud (3)  
1 blackfly larvae (2)  
1 mayfly nymph (4)

$$(2 \times 4) + (2 \times 3) + (1 \times 2) = 16$$

Stream B

1 mayfly (4)  
1 maggot (1)  
1 stonefly (4)  
1 caddisfly (4)  
1 midge (2)  
1 damselfly (3)

$$(3 \times 4) + (1 \times 3) + (1 \times 2) = 17$$

## Station 3: Water Monitoring and Analysis Station

-ON-SITE measurement

-pH, temp, nitrates, DO (do test beforehand), phosphates, turbidity, and relationship to one another

-perform water quality tests

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### pH:

- (1 point)** 1) A water sample with a pH of 2 is considered to be:
- basic.
  - acidic.
  - neutral.
  - perfect for aquatic life.

**Answer:** b

- (1 point)** 2) . (True/False) The pH of natural water falls between 9 and 14.

**Answer:** False

- (1 point)** 3) Compare the color of the sample to the pH color chart. Record the result as pH.

- (1 point)** 4) Is this result poor, good or excellent?

**Turbidity:**

- (1 point) 5) The turbidity test indicates:
- a) the odor of water.
  - b) mineral concentration of water.
  - c) suspended material in the water.
  - d) metal concentration of water.

**Answer:** c

- (1 point) 6) Hold the turbidity chart on the top edge of the jar. Looking down into the jar, compare the appearance of the secchi disk icon in the jar to the chart. Record the result in JTU. \_\_\_\_\_

- (1 point) 7) Does this result indicate good or poor conditions?

- (1 point) 8) For what do the letters JTU stand?

**Answer:** Jackson turbidity units

**Secchi disk:**

- (1 point) 9) 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.

**Answer:** b

- (1 point) 10) Pollutants have a tendency to concentrate in higher life forms because:
- a) pollutants become more toxic as time passes.
  - b) evaporation of lakes and streams concentrates them.
  - c) bioaccumulation of pollutants in the food chain.
  - d) higher life forms drink water.

**Answer:** c

**Dissolved oxygen:**

(1 point) 11) (True/False) Warm water can hold more dissolved oxygen than cold water.

**Answer:** False

(1 point) 12) Record the dissolved oxygen result of the water sample using the color chart.

(2 points) 13) We record the water temperature as 16° C. Consult the color chart for dissolved oxygen and record it from question 12. What is the percent saturation of the sample using the chart? \_\_\_\_\_. Is this good, fair or poor?

(1 point) 14) (True/False) Temperature effects the amount of dissolved oxygen in water.

**Answer:** True

**Nutrients:**

(2 points) 15) Name two nutrients needed for plant and animal growth and are fundamental elements in metabolic reactions.

**Answer:** Phosphorus and nitrogen

(1 point) 16) Compare the color of samples to the phosphate color chart. Record the result as ppm phosphate.

(1 point) 17) Is this result good or bad?

(1 point) 18) Compare the color of the sample to the nitrate color chart. Record the result as ppm nitrate.

(1 point) 19) Is this result good or bad?

**Fecal Coliform:**

(1 point) 20) Explain why fecal coliform bacteria is used as an indicator of poor water quality.

**Answer:** indicator of sewage bacteria

(1 point) 21) Compare the appearance of the tube to the picture on the coliform color chart. Is the result positive or negative?

**Answer:** Positive

**Alkalinity:**

- (1 point) 22) Hard water is a term commonly used to describe:
- a) frozen springs.
  - b) groundwater found in arid areas.
  - c) water with many dissolved ions.
  - d) water distilled from acid rain.

**Answer:** c

(3 points) 23) Alkalinity is the result of three negatively charged ions which shift pH to the alkaline (basic) side of neutrality. Name these three negatively charged ions.

**Answer:** bicarbonate ( $\text{HCO}_3$ ), carbonate ( $\text{CO}_3$ ), and hydroxide ( $\text{OH}^-$ )

**Biological Oxygen Demand:**

(1 point) 24) Describe Biological Oxygen Demand, or BOD.

**Answer:** Measure of the quantity of dissolved  $\text{O}_2$  used by bacteria as they break down organic wastes

(2 points) 25) Name two reasons why people would be interested in sampling water for its quality.

**Answer:** pollution, fish health

(1 point) 26) The hydrological cycle involves evaporation, precipitation, transpiration, infiltration, percolation, and runoff. Which of these terms describes the release of water from atmospheric vapor?

- a) evaporation
- b) precipitation
- c) transpiration
- d) percolation

**Answer:** b

- (1 point) 27) The hydrologic cycle is a term that describes:
- a) the eventual loss of all water from the earth.
  - b) why three-quarters of the earth's surface is covered by water.
  - c) when we can expect heavy rains and floods.
  - d) the continuous natural recycling of water on the earth.

**Answer:** d