

SI Environmental Science - Full Discipline Demo

Water Quality

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Environmental Science - Full Discipline Demo
Course	SI Environmental Science - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Match each term with the best description.

⚡ Effluent	Contamination from multiple diffuse sources	1
⚡ Eutrophication	Process of transporting water through evaporation, condensation, precipitation, runoff, and infiltration	2
⚡ Water quality	Measure of the suitability of water for a particular use based on physical, chemical, and biological characteristics	3
⚡ Nonpoint source pollution	Nutrient enrichment leading to algal blooms	4
⚡ Hydrologic cycle	Wastewater from manufacturing and sewage treatment facilities	5

Correct answers:

- 1 Nonpoint source pollution 2 Hydrologic cycle 3 Water quality
4 Eutrophication 5 Effluent

Identify each statement as true or false.

⚡ All strains of <i>Escherichia coli</i> are harmful to humans.	
⚡ High phosphate levels in drinking water are harmful to humans.	
⚡ Nitrogen excess causes eutrophication in water bodies.	
⚡ The presence of fecal coliform during water testing indicates contamination has occurred.	
True	False
1	2

Correct answers:

1 Nitrogen excess causes eutrophication in water bodies.

The presence of fecal coliform during water testing indicates contamination has occurred.

2 High phosphate levels in drinking water are harmful to humans.

All strains of *Escherichia coli* are harmful to humans.

Exploration

Most of earth's water occurs as vapor in the atmosphere.

- ☐ True
- ☒ False



_____ is an example of nonpoint source pollution.

- ☐ Agricultural field runoff
- ☐ Lawn fertilizer runoff
- ☐ Road salt runoff
- ☒ All of the above

✓

A pH level between _____ is the ideal range for most aquatic organisms.

- ☐ 2.5 to 4.0
- ☐ 4.5 to 6.0
- ☒ 6.5 to 8.5
- ☐ 9.0 to 10.5

✓

Eutrophication results in _____.

- ☐ algal blooms
- ☐ oxygen depletion
- ☐ aquatic animal death
- ☒ All of the above

✓

A positive fecal coliform bacteria test is an indicator that pathogenic species are present in the water sample.

- ☐ True
- ☒ False

✓

Exercise 1

How do the test results compare for your tap water and bottled water samples? Explain which source you would prefer to consume based on your results recorded in Data Table 2.

Student answers should correlate with the recorded results in Data Table 2. SI results suggest the bottled water sample is safer for consumption than the tap water sample based on lower levels of nitrates. While phosphate levels are not linked to human health, the bottled water sample also had lower levels of this compound. Neither sample was outside the acceptable range of pH, nor did either sample test positive for coliform bacteria.

Did the water body sample have phosphate and/or nitrate levels that might put it at risk for eutrophication and subsequent algal blooms? Explain your reasoning.

Student answers should correlate with the nitrate and phosphate levels recorded in Data Table 2. The internally tested sample from an aquaponics system would be at risk of eutrophication since both nitrates and phosphates tested in the poor category.

List three potential sources of pollution in your water body sample based on the location recorded in Data Table 1. Classify each potential source as a point source or nonpoint source.

Student answers should reference the location recorded in Data Table 1 and consist of nonpoint source pollution originating from runoff from roadways, agricultural fields, acid rain, industrial areas, and urban areas. Students should only list point source pollution if effluent was observed being discharged into the water body.

Data Table 1: Source of Water Samples
(SAMPLE ANSWER BELOW)

	Bottled Water	Tap Water	Water Body
Source	Waterlogic	Municipal	Aquaponics system
Description	Commercially filtered drinking water supplier	Englewood, CO	In office, Englewood CO

Data Table 2: Test Results
(SAMPLE ANSWER BELOW)

	Bottled Water	Tap Water	Water Body Sample
Phosphate Level (ppm and interpretation)	<1, Okay	2, poor	1, poor
Nitrate Level (ppm and interpretation)	<5, Okay	40, poor	20, poor
pH and interpretation	6, good	8, good	7, excellent
Coliform (color and interpretation)	purple, absent	purple, absent	yellow, present

Photo 1: Phosphate Test Results
(SAMPLE ANSWER BELOW)

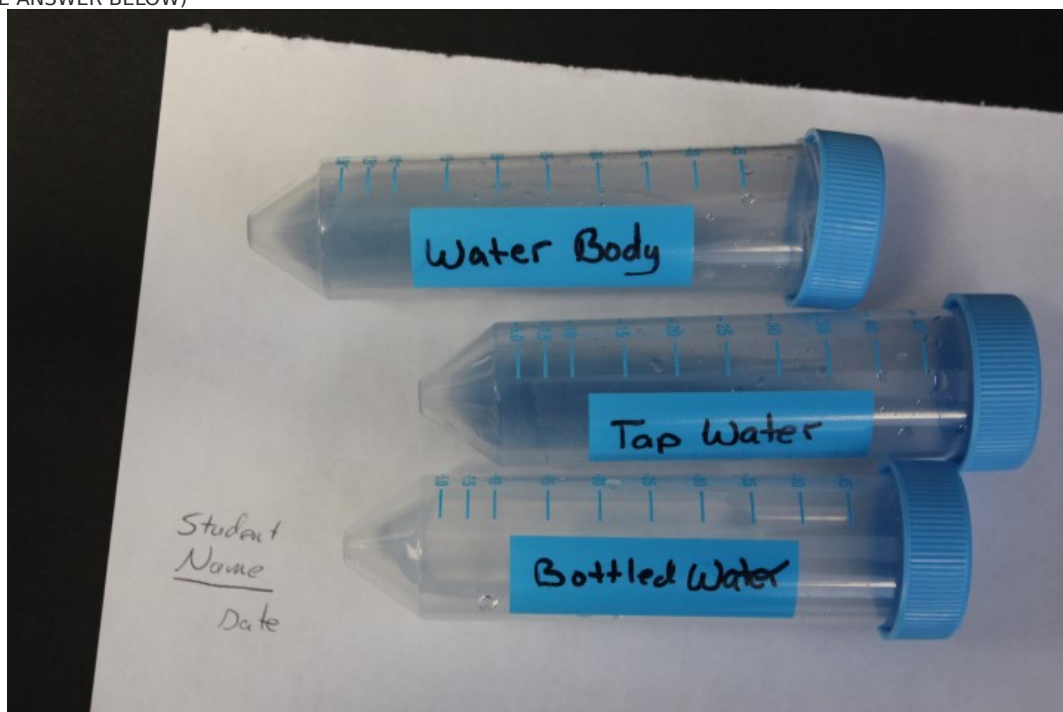


Photo 2: Nitrate Test Results
(SAMPLE ANSWER BELOW)

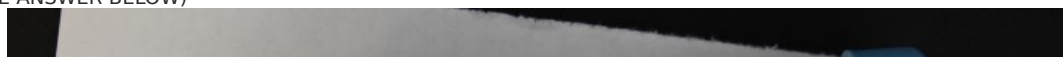
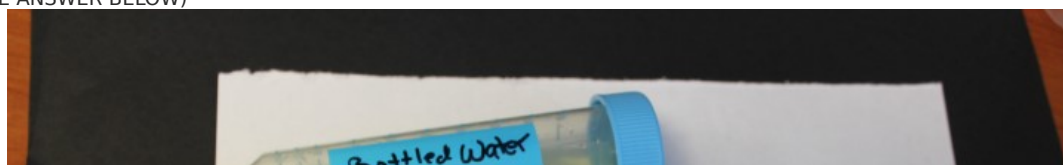




Photo 3: pH Test Results
(SAMPLE ANSWER BELOW)



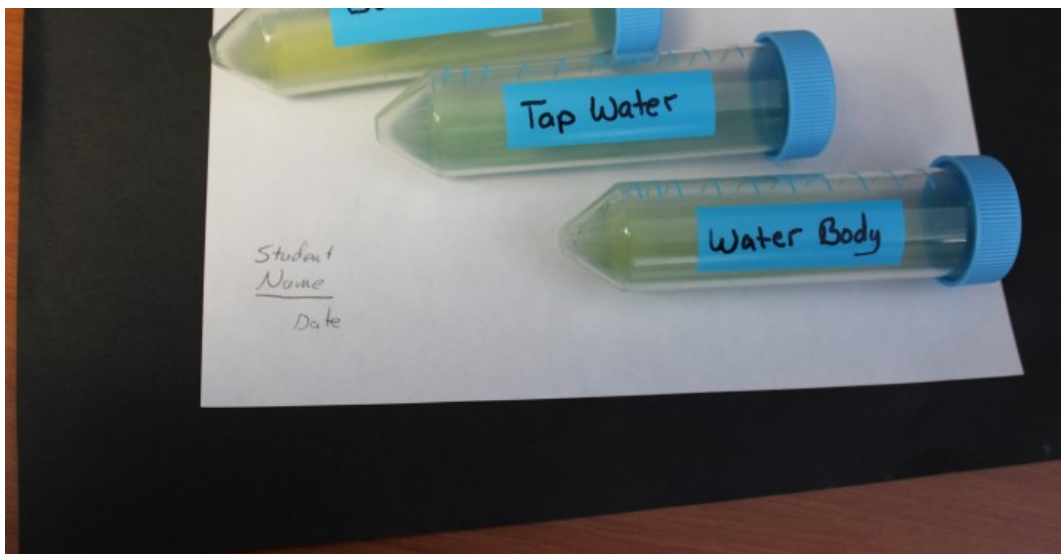
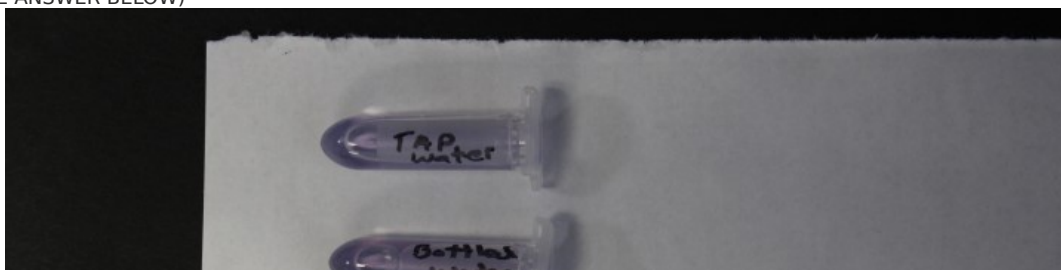
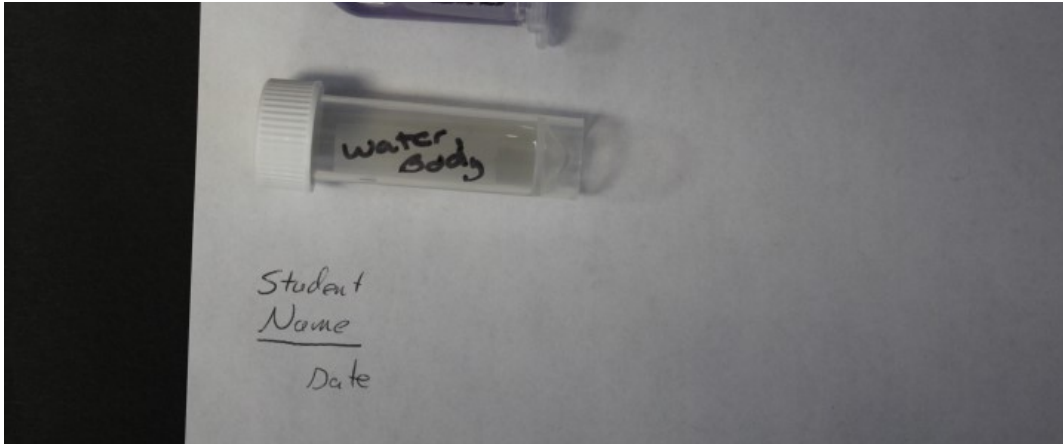


Photo 4: Coliform Test Results
(SAMPLE ANSWER BELOW)





Competency Review

Water quality is based on the ____ characteristics of water.

- ☐ physical
- ☐ chemical
- ☐ biological
- ☒ All of the above



Nonpoint source pollution originates from factory effluent pipes.

- ☐ True
 - ☒ False
- ✓

Clams and mussels cannot survive long-term in waters that are below pH ____.

- ☒ 6.0
 - ☐ 7.0
 - ☐ 8.0
 - ☐ 9.0
- ✓

Eutrophication occurs when nitrogen and phosphorus are limited.

- ☐ True
 - ☒ False
- ✓

High levels of ____ in drinking water may result in oxygen transport restriction in human infants.

- ☐ fecal coliform bacteria
 - ☒ nitrates
 - ☐ phosphates
 - ☐ pH
- ✓

Water is tested for ____ to determine if contamination by animal waste has occurred.

- ☒ fecal coliform bacteria
 - ☐ pH
 - ☐ phosphorus
 - ☐ nitrates
- ✓

A water sample with a pH of ____ is considered excellent quality for drinking.

- ☐ 2
- ☒ 7 ✓
- ☐ 11
- ☐ 13

A water sample should be quality tested as soon as possible after it is collected.

- ☒ True ✓
- ☐ False

Environmental sources associated with a positive fecal coliform test may include animal waste runoff and damage to sewage treatment infrastructure.

- ☒ True ✓
- ☐ False

Extension Questions

An aquarium keeper exchanges 50% of the tank water each month with fresh tap water from a municipal water supply. Within 24 hours after each exchange, the aquarium experiences an algal bloom. Apply your knowledge of water quality to explain why this could be occurring. (SAMPLE ANSWER BELOW)

The aquarium is experiencing an algal bloom after each water exchange due to an excess of nutrients in the tap water. Both nitrates and phosphates are responsible for eutrophication in water bodies. Since the tap water is from a municipal source, it must conform to guidelines for nitrates, but not phosphates. Therefore, the phosphate levels in the tap water are most likely at the levels that lead to eutrophication.