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The Water

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Water is Everywhere

Water is everywhere, thus, we tend to take it for granted. However, accessing to clean water has been inequitable; climate change has been threatening the sea water level, causing the acidification of ocean water. In this project, we will investigate the environmental and social issues on clean water, the impacts on our life by reading the following articles, watching the videos, exploring activities.

In the group project, 3-4 students per group, each team member must be assigned responsibilities to work on the project integrating the following questions. Your individual lab report is following APA format, min. single spaced 5-paged paper, including proper citations (in-text or works cited).

Reading articles

1. [All about Water](#)
2. [Properties of water](#)
3. [Flint Water Crisis Chemistry](#)
4. [How Lead ended up in Flint water?](#)

Videos to watch

[Chemistry of Water](#)

[Lead in Drinking Water](#)

[How to test your home to detect lead?](#)

Pre-lab activity) Each group will be given two conical tubes, fill the tubes with your water at home, Guttman, public bathrooms (Penn station or Port authority bathrooms), or restaurants. Discuss with your group who and where you will collect water sample, and fill out the form below upon collecting it. Bring in the two tubes to the next lab session, label to one tube your names and chemistry lab activity. This sample will subsequently be analyzed in the lab to investigate the following parameters in the experimental section.

Water sample collection date: ___/___/_____

Time of collection: ___:___

Place of collection: _____

Experiments

Name:

Date:

Lab Partner(s):

Water sample collection date: ___/___/_____

Time of collection: ___:___

Place of collection: _____

Note that some of following instructions were adapted from the water quality analysis protocols developed by the EarthEcho Water Challenge team

<https://www.nalms.org/secchidipin/monitoring-methods/the-secchi-disk/is-there-a-proper-design-for-a-secchi-disk/>

<https://www.monitorwater.org/tools/event-resources>

I. Turbidity test: Turbidity is a measure related with the transparency of a fluid. You should not confuse the turbidity of water with its color as water with dark color can still be transparent, think of muddy water.

Turbidity measurement: 1. Fill the flask previously prepared with the Secchi completely with sea water. 2. Put the Turbidity Table in the superior part of the flask. Compare the appearance of the Secchi disk inside the flask with the images on the Table. Report the result of the measurement of water turbidity in JTU (**Jackson Turbidity Unit**: Measurement unit for water turbidity. It measures the **reduction of light**)

<https://www.youtube.com/watch?v=XYjh6sD6Bqk>

Turbidity of collected water: _____ JTU

II. pH test: The pH meter provides a more correct value of the sample's pH. Your instructor will demonstrate how to use the Vernier pH meter. Prior to measuring the pH of your water sample, discuss with your group members the expected pH of your drinking water, elaborate your reasoning to support.

Expected (recommended) pH of water sample _____

Actual pH of water sample _____

Discuss the reason why your actual pH is far off from the expected (recommended) value, any health, environmental impacts by drinking this water, and what actions need to be taken.

III. Metals detection: please read the articles on toxic metals:

<https://extension.usu.edu/waterquality/learnaboutsurfacewater/propertiesofwater/metals>

<https://www.osha.gov/SLTC/metalsheavy>

<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>

Detecting the presence of metals in water requires Inductively Coupled Plasma Mass Spectrometry (ICP-MS). As each metal has its own molecular weight and charge, employing ICP-MS experiment is easiest and fastest way to determine which metals present in sample solution. In addition, atomic absorption spectroscopy (AAS), atomic emission spectroscopy (AES), and X-ray fluorescence are among laboratory techniques to determine the concentration of metals in drinking water. Unfortunately, Guttman Community College is not equipped with advance instrumentation, we use test strips to investigate the types of metals in drinking water. Please note that this method is low-budget, handy, but less accurate than spectrometry instrumentation.

1. Prior to testing your water, discuss common metals detected in drinking water, report them in Table 1 including the sources, effects on our health, and its permissible level by the EPA.

Table 1.

metals	sources	effects	Permissible level

2. Testing your water with test strips.
 - a. Dip 1 test strip into a 5 ml water sample for 30 seconds.
 - b. Take strip out and shake it to remove excess water.
 - c. Wait 2 minutes, and match with closest color on the color chart (included), fill out the following table

Parameter (metal/chemicals/hardness etc)	Matched color	observation	conclusion

IV. Class Discussion (30 mins) - each group will report their results to classmates, make a table to compare their data. report this to the discussion section.

V. Use the following prompts to work on your final project report.

1. Discuss Water’s unique properties allow life to exist on Earth.
2. Discuss the planet's limited freshwater resources.
3. Explain the importance of maintaining fresh, unpolluted drinking water supplies.
4. Describe sources and consequences of poor water quality.
5. Describe how humans affect the movement of water within the urban water cycle.
6. Do research on EPA guideline for drinking water requirement such as legal limits on chemical contaminants.
7. Every community is required to provide a Consumer Confidence Report (CCR). Obtain a copy of your area CCR, research the quality of your drinking water, and discuss what recommendations the community should take to meet the safety levels.
8. Upon watching, reading the Flint water crisis, discuss the following questions:
 - a. What are the sources of lead, Pb^{2+} , in Flint, MI drinking water? Discuss the legal level for lead in drinking water and the health effects.
 - b. What is orthophosphate? Where it came from? How it reacts with lead, Pb^{2+} ? What is the minimum orthophosphate concentration required to keep Pb^{2+} concentrations below 15 ppb? Please write a chemical equation to show the formation lead precipitate.
 - c. Flint residents complained of brown colored water from their faucets before the treatment of orthophosphate. Discuss why the city did orthophosphate treatment. Why it was necessary?

- d. Do you think road salt for deicing contribute to the Flint water crisis? Explain deicing process in terms of freezing point depression.
9. Having access to clean water is among fundamental human rights. Suppose that you have a water crisis at home, such as tainted water, limited supply such as 2 gallons per day. How would the issue affect your daily life? What actions you as a citizen would need to take?
10. Discuss any racism in how the government handling in the water crisis
11. Discuss any water crisis in your area, such as sewer line burst in Rockaway in NY, illegal chemical dumping etc.
12. Do you think water is renewable or nonrenewable resource? Refute or support your reasoning with evidence.

Final Project Report Template

Within this document you will learn how to approach formatting your research project. Your research paper should have a natural flow that consists of:

1. The introduction of your paper
2. The body of your paper (Experiment section)
3. The conclusion of your paper
4. The reference section

Overall, your paper should be a minimum of 5 pages in length (single spaced). You must also include references using the APA in text format and reference page. Below, I will inform you of what should be discussed in each section. Let us start with the introduction!

1. Introduction:

In this section, you must include background information on water. Please work on prompts #1-7 for this section:

Discuss prompts #1-7:

What is water? Why is water important?

Discuss Water's unique (physical and chemical) properties, how they allow life to exist on Earth.

Complete your introduction by discussing the importance of understanding water from both a chemical and biological standpoint. Briefly highlight what you aim to discuss within the body of the paper.

2. Experimental and Results:

The body of this paper must include your experimental results (**Turbidity test, pH test, metal detection, and class discussion**) and discuss your results using your data for each test.

3. Conclusion:

In the conclusion section of your paper, you must first briefly summarize the main points of the your results and then include the answers to **prompts #8-12**

4. Reference Page:

Be sure to list all references used for the paper.

Do not plagiarize and to stay away from multiple direct quotes from your sources. One of the tasks within this project is to paraphrase! Rewrite statements in your own words.