What’s In My Water?

Lesson Goals

* Students will analyze water samples for contaminants.

Materials Needed

* Tables for testing results
* Contaminated water for testing
* Equipment to test for contaminants

Pre-lab questions

1. What drives water through the water cycle? ­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Is the water evaporated pure water (H2O), or are there other materials mixed with it? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What happens to the water after it evaporates? ­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. If you test the water in nearby streams, groundwater, lakes, will you find pure H2O? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Predict some of the things you might find? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­\_\_

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**Procedures: Testing for Water Contamination**

1. This activity can be done at actual stream, groundwater (well), lake, or other sites outside, or with samples collected from representative sites, or with samples "manufactured" to represent various contaminants.
2. Students work in pairs or small groups.
3. Test for contaminants using the water quality testing kits and the thermometer.

To test ph:

1. Fill one test tube with sample water to 5 mL
2. Carefully add 10 drops of the wide-range indicatior to the test tube
3. Cap the test tube and shake the solution gently until the color is uniform. (Do not cover the tube with your fingers. It is bad lab practice and it might change the pH of the solution.)
4. Hold the test tube into a light source to check the color.
5. Look at a pH chart and record the pH value on your table.
6. Have a lab partner take another sample so that you can double check each other.
7. Pour out the test tube and clean and dry it and then place everything back where it goes.

For Nitrares:

1. Fill the water bottle with sample water.
2. Fill one of the test tubes to the 2.5 mL line with water from the sample water bottle. Hold the test tube at eye level and read the level form the lowest point of the meniscus.
3. Carefully continue filling the test tube up to the 5 mL line with the mixed acid reagent.
4. Put the cap on the test tube, mix gently, and wait two minutes.
5. Using the small white measuring spoom, carefully add one level scoop (.1g) of Nitrate Reducing Agent.
6. Put the caps back on the test tube and the bottle of Nitrate Reducing Agent. Invert the test tube gently 50-60 times in one minute, then wait ten minutes.
7. Match the color of the sample in the tube as closely as possible to one of the standards.
8. Record our results on the table.

For Turbidity:

1. Fill one turbidity tube to the 50 mL line with clear waer, either from the tap or bottled water.
2. Fill the other turbidity tube to the 50 mL line with the sample water.
3. Hold the tubes side-b-side in the light, and look through thtem vertically. Compare their cloudiness by observing the fuzziness of the black dot at the bottom of the tube.
4. Shake the Standard Turbidity Reagent vigorously and add .5 mL to the tube of clear water. The reagent will mae the clear water turn slightly cloudy or turbid. Stir the waer in each tube with the stirring rods.
5. Compare the turbidity again by looking down into the water in each tube. If the sample water is still more turbid than the clear water, continue adding the Turbidity Reagent by .5 mL increments until both tubes appear equally cloudy.
6. Compute the Jackson urbidity Units of the sample. Each .5 mL of Turbidity Reagent that you added to the clear water equals 5 Jackson Turbidity Units.
7. Record your result in the table.

For Chloride:

1. Rinse test tube with sample water. Fill with sample to 5 mL.
2. If sulfites are present, add 5 drops of Hydrogen Peroxide. Swirl for 30 seconds.
3. Add 1 drop of Phenolphthalein Indicator. Mix. If solution is pink add Sulfuric acid, one drop at a time, swirling after each drop, until pink color changes to colorless. If solution is already colorless, proceed to number 4.
4. Add 1 drop of chloride reagent.
5. Add Silver Nitrate, one drop ata time, swirling and counting the number of drops, ntil the yellow color changes to orange-brown.
6. Multiply number of drops by 10. Record as ppm chloride

For temperature:

1. At the site where the other water quality test are being performed, lower the thermometer four inches below water surface.
2. Keep the thermometer in the water until a constant reading is attained.
3. Record the measurement in Celsius.
4. Record temperature on table.

For Dissolved O:

1. Rinse the water Sampling Bottle with the sample water.
2. Tightly cap the bottle, and submerge it to the desired depth.
3. Remove the cap and allow the bottle to fill.
4. Tap the sides of the bottle to dislodege any air bubbles.
5. Rplace the cap while the bottle is still submerged.
6. Retrieve the bottle and make sure that no air bubbles are trapped inside.
7. Remove the cap from the bottle
8. Immediately add 8 drops of Manganous Sulfate Solution and 8 drops of Alkaline Potassium Iodide Azide.
9. Cap the bottle and mix by inverting severl times A precipitate will form.
10. Allow the precipitate to settle below the shoulder of the bottle.
11. Add 8 drops of Sulfuric Acid
12. Cap and gently invert the bottle to mix the contents until the precipitate and the reagent have totally dissolved. The solution will be clear yellow to orange if the sample contains dissolved Oxygen.

For Alkalinity:

1. Fill a beaker up with sample water.
2. Dip a test strip into the water
3. Hold the test strip out of the water for about 2 minutes.
4. Compare the colors of the test strip to the colors of the chart on the bottle to determine if the alkalinity reading is low, in range or high.
5. Record data on table.

4. Complete data table using the results of your tests.

5. Share your results with at least 2 other groups.

**Assessment Questions:**

1. Are the same contaminants in every sample? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What are possible sources of these contaminants? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Are all of these sources human made, or are some natural sources of contamination? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Do these sources of contamination come from very localized sources or from larger sources? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Table 1: Results of water testing

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Sample | pH | Nitrate (Mg/L) | TURBIDITY  (JTU) | CHLORIDE (mg/L) | Temp °C | Dissolved O | ALKALINITY (mg/L) |
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