The Education Program at the
NJ Marine Sciences Consortium/NJ Sea Grant
22 Magruder Road Fort Hancock, NJ 07732 732-872-1300   njmsc.org

WATER QUALITY MONITORING

OVERVIEW

This lesson describes testing methods for four important parameters of water quality, dissolved oxygen, **pH, salinity** and **clarity/turbidity**.

OBJECTIVES

Following completion of this lesson, the students will be able to:

- Understand four parameters of water quality.
- Be able to perform tests for **salinity**, dissolved oxygen, **pH** and **clarity/turbidity**
- Understand why scientists and environmental managers monitor water quality and aquatic resources.

GRADE LEVELS

6th -12th grades

NJCC STANDARDS

Science Indicators:
5.1, 5.3, 5.4, 5.5, 5.7, 5.8, 5.10

MATERIALS

- **Hydrometer**, LaMotte Winkler - Titration Method Dissolved
- Oxygen, bucket, water sample, chemical waste receptacle,
- Thermometer, Ammonia test kit, secchi disk, Hach **pH** test kit.

PROCEDURES

Dissolved Oxygen Test Instructions:

1. Rinse the sample bottle three times. Obtain an air-tight sample by submerging the sample bottle fully under the water and slowly allow the water to fill the bottle and cap the bottle under water.
2. Uncap sample bottle, making sure that the plastic cone from the cap stays in the cap. This plastic cone in the cap displaces the proper amount of water to allow room for the chemicals to be added to the sample. Keep the plastic cone in the cap at all times.
3. Add 8 drops of Manganous Sulfate solution (pinkish solution) and 8 drops of Alkaline Potassium Iodide Azide Solution (same size bottle, clear solution).
4. Cap the sample bottle and mix by inverting several times. A precipitate will form.
5. Place the bottle in an undisturbed area and allow precipitate to settle below the shoulder of the bottle. (About 5 minutes.)
6. Add 8 drops of Sulfuric Acid (clear solution with red cap). Cap and gently shake until precipitate is completely dissolved.
7. Fill titration tube (glass bottle and cap with hole in top) to the 20 ml mark.
8. Fill the direct reading titrator (syringe) with Sodium Thiosulfate. When filling the direct reading titrator, the upper part of the black rubber stopper should be even with the zero mark. Make sure that there are no air bubbles in the column.
9. Insert the direct reading titrator into the center hole of the titration tube cap.
10. Add one drop of Sodium Thiosulfate and gently swirl the tube. Continue one drop at a time until the yellow-brown color is reduced

to a very faint yellow. The term "very faint" is subjective. It is helpful to bring a piece of white paper with you to hold the sample up against to determine the faintness of the color.
11. Remove the titration tube cap, being careful not to disturb the plunger. Add 8 drops of the Starch Indicator Solution and gently swirl.
12. Replace the titration cap. Continue adding one drop of Sodium Thiosulfate at a time and swirl until the blue solution turns clear.
13. Read the test result where the plunger tip meets the scale. Record as ppm (parts per million) of dissolved oxygen.

pH Testing Procedure:

1. Rinse each test tube with the water sample. Gloves should be worn if hands need to be in contact with the water.
2. Fill both tubes with sample water to the first line (5 ml mark).
3. Add 6 drops of Wide Range 4 **pH** indicator solution into one tube and swirl to mix. This is your prepared sample.
4. Place the tube of the prepared sample into the right opening of the comparator.
5. Place the other tube into the other opening as a blank comparison.
6. Hold the comparator up to the light source (or sun). Match the color on the comparator to the color of the prepared sample.
7. The number on the comparator that best matches with the sample is the **pH**.
8. Record the **pH** value.
9. Wash your hands.

Discussion
1. What can happen if there is a sudden change in the **pH** value of the water?
2. Why is it important to know the **pH** of the water?
3. What living things are very vulnerable to a change in **pH**?

Clarity and Turbidity Test Procedure

1. Lower the Secchi Disk into the waterbody.
2. Stop when you can no longer see the disk.
3. Slowly pull the disk out of the water and see how deep it went into the water by measurements on the rope before it was out of view. Repeat the procedure. Average the two readings.
4. How many "knots" or meters deep did it go? Record your answer.

Discussion
1. What factors contribute to **turbidity**?
2. What happens to loose soil from construction sites?
3. What happens to the large population of plankton in summer?
4. What happens to the sediment from bare lawns and unprotected shorelines?
5. What happens when excess nutrients from run off cause the growth of algae?
6. Why is there usually higher **turbidity** in the summer than the winter?
7. What happens if underwater plants do not get enough light?

Measuring Salinity

1. Fill a 100 ml graduated cylinder with your water sample.
2. Using a thermometer record the temperature, then remove the thermometer.
3. Place the **hydrometer** in the cylinder. Wait until the **hydrometer** has stopped bobbing around.
4. Read and record the specific gravity, the number on the **hydrometer** that is in line with the water level. Be sure your eye is even with the water level in the jar, viewing up or down or at an angle can give an inaccurate reading
5. Use the **salinity** conversion table to get the **salinity** reading in parts per thousand.

Discussion
1. Why is it important to know the **salinity** of a body of water?
2. How could changes in **salinity** effect organisms living saltwater?
3. What factors could lower or increase **salinity**?
4. Why don't we use specific gravity only to measure the amount of salt in the water?

BACKGROUND

The beach is one of the earth's most dynamic environments. Beaches are zones of active sand movement, with sand constantly migrating and responding to natural and human forces. It is important to keep in mind that the beach is not just what we see above water but extends from the toe of the **dune** to an offshore depth of 40 to 50 feet.

A natural beach is a logical environment that builds up when waves and winds are gentle, and strategically but only temporarily, retreats when confronted by big storm waves. This system depends on four factors: wave energy, water level, the amount of beach sand, and shape of the beach. The relationship among these factors is a natural balance and is referred to as a dynamic equilibrium. When one factor changes, the others adjust accordingly to maintain a balance. When we alter this system, as we often do, the dynamic equilibrium continues to function in a predictable way, but in a way that often has repercussions for our use of the system. It is to our benefit, therefore, to understand how the natural shoreline system functions. Humans intervene with the natural beach processes by building structures such as homes, snow fences, jetties, groins, sea walls and by replenishment of sand to the **foreshore**.

VOCABULARY

D.O. - Dissolved Oxygen- a free oxygen molecule dissolved in water for use by respiring organisms and plants.

Hydrometer - A floating instrument used to determine the specific gravities of liquids.

pH- a measure of how acidic or basic a solution is measured on a scale from 0-14.

Salinity- the amount of salts dissolved in water.

Turbity- the cloudiness of water caused by total amount of suspended solids in the water.

REFERENCES

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