The Education Program at the
New Jersey Sea Grant Consortium
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pH

OVERVIEW During this activity, students learn to use a Colorimetric test to measure pH and gain an understanding of pH and its importance to life in an aquatic ecosystem

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

- Test the pH level of a water sample,
  Understand the dramatic effect pH level can have on a water body.

GRADE LEVELS 5^{th} -12^{th} grades

NJCC STANDARDS **Science Indicators:**
5.1, 5.3, 5.4, 5.5, 5.7, 5.8, 5.9, 5.10

MATERIALS

- Water sample (freshly drawn),
- LaMotte pH Colorimetric test,
- Chemical waste receptacle,
- Hand-held pH meter (optional)

PROCEDURES

- Water sample (freshly drawn),
- LaMotte pH Colorimetric test,
- Chemical waste receptacle,
- Hand-held pH meter (optional)

BACKGROUND The pH test is one of the most common analyses in water testing and a great indicator of water quality. pH indicates the sample's acidity or alkalinity by measuring the relative amount of hydrogen (H) and hydroxyl (OH) ions in the water. Water that has more H ions is acidic, whereas water that has more OH ions is basic or alkaline.

pH measurements runs on a scale from 0 to 14, with 7.0 considered neutral. Solutions with a pH below 7.0 are considered acids and those between 7.0 and 14.0 are considered bases. A range of pH 6.5 to 8.5 is optimal for most organisms. Most fish can tolerate pH values of about 5.0 to 9.0.

In a lake or a pond, water's pH is affected by its age and the chemicals discharged by communities and industries. Most lakes are basic when they are first formed and become more acidic with time due to the build-up of organic materials. As organic substances decay, carbon dioxide forms and combines with water to produce a weak acid called carbonic acid. Large amounts of carbonic acid lower the water's pH.

Rapidly growing algae or **SAV** remove carbon dioxide from the water during photosynthesis. This can result in a significant increase in pH levels.

The pH of salt water is not as vulnerable as fresh water's pH to acid wastes. This is because the different salts in sea water tend to **buffer** the water. Normal pH values in seawater are about 8.2 at the surface and decrease to about 7.7 in deep water. Many shellfish and algae are more sensitive than fish to large changes in pH, so they need the sea's relatively stable pH environment to survive.

Changes in the **pH** value of water are important to many organisms. Most organisms have adapted to life in water of a specific **pH**. Immature stages of aquatic insects and immature fish are extremely sensitive to **pH** values. Some species are so sensitive to changes in the pH they may perish if the pH changes even slightly.

VOCABULARY

Buffer - A substance capable of neutralizing both acids and bases in a solution, thereby maintaining the original pH.

SAV - Submerged Aquatic Vegetation

Reagent - A substance used in a chemical reaction to detect, measure, analyze or produce other substances.

EXTENSIONS

Use the topic of pH to lead into the topic of acid rain and the problems that are occurring in the environment due to acid rain.

REFERENCES

Cliff Jacobson. 1991. Water, Water, Everywhere - Water Quality Factors Reference Unit. Hach Chemical Company.

Gayla Campbell and Steve Wildberger. 1992. The Monitor's Handbook. LaMotte Chemical Company.

REV. 11/11/10