

Effects of pH on Water Quality

I. Science Grade Level Indicators.

Grade 7

Life Science

2. Know that the number of organisms an ecosystem can support depends on adequate biotic (living) and abiotic (non-living) resources (e.g., light).
6. Analyze how human activity and natural events impact the ecosystems of the earth.
8. Know that some environmental changes occur slowly while others occur rapidly. The different consequences of changing environments in small increments over long periods of time as compared with changing environments in large increments over short periods of time.

Scientific Inquiry

1. Understand that variables and controls can affect the results of an investigation, and that (ideally) one variable should be tested at a time, because it is not always possible to control all variables.
2. Recognize and analyze alternative explanations and predications; there may be more than one good way to interpret a given set of findings.

3. Identify faulty reasoning and statements that go beyond the evidence.

6. Use graphs, tables, and charts to predict physical phenomena, and infer mathematical relationships among variables (e.g., speed, momentum).

7. Choose and safely use appropriate tools and instruments.

8. Use safety equipment appropriately in the science classroom.

11. Construct a hypothesis to test a question.

Grade 8

Life Science

10. Understand that when the environment changes a species' characteristics affect its chances of survival.

11. Know that the variation of organisms within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

Scientific Inquiry

1. Introduce concepts of sample size and control, and understand how these affect scientific investigations.
2. Read, construct, and interpret data in various form (e.g. tables, charts, graphs, diagrams, symbols) produced by self and others in both written and oral form.

II. Objectives.

1. Students will be able to determine the pH level of a water sample using the Lamotte test kit.
2. Students will be able to predict the macroinvertebrates living in a body of water using the pH level and a macroinvertebrate reference chart.
3. Students will compare and contrast the pH level of different water samples by constructing a line graph of class data.

III. Background

Another test that indicates the quality of water is the pH test. pH is the measure of the number of hydrogen ions present in a body of water. pH is measured on a scale of 0 – 14 with 7 being considered neutral. Water that measures below 7 is acidic and above 7 is alkaline. Most macroinvertebrates can survive in water with a pH of 5 – 9. The pH of the water changes when the water is changing chemically. Water that has more free hydrogen ions is acidic while water with more hydroxyl ions is more alkaline.

Pollution can change the pH of water, which can harm macroinvertebrates in the water.

IV. Materials.

1. Lamotte Precision Wide Range pH test kit.
2. Water samples.
3. Water sample collecting bottles.
4. Waste collecting container.
5. Eye droppers.
6. Pictures of streams where samples were collected.
7. Paper towels.
8. Safety goggles.
9. Latex gloves.
10. Macro-invertebrate reference chart.
11. Graph paper.
12. Metric ruler.

V. Procedure.

1. Review pH. Ask students what they know about acidity, alkalinity and the pH scale. Have students name substances with acidic or alkaline pH's.
2. Divide students into groups of 2 or 3.
3. Have students obtain test materials and samples.
4. Have students review procedures and answer any questions.
5. Students should test each of the samples and record their data.

6. Data from the individual groups should be compiled either on the chalkboard or the overhead.
7. The students will use the class data and construct a line graph with the line of best fit.
8. The students will analyze the results of the class data to determine what types of macroinvertebrates might live in the various water samples.

VI. Assessment.

1. Have students assess the quality of several water samples and determine how the numbers of organisms will vary from sample to sample based on the pH.
2. Teach students to perform chemical tests. Assess their ability to conduct these tests accurately by providing known samples for them analyze.
3. Have students compare their pH test results with those of their classmates by constructing a line graph of class data.