

Basic Soil Chemistry: pH

Essential Question:

How can we measure the pH of soil?

How does soil pH effect different soil workers?

At a Glance: Learners use pH paper to measure the pH of soil and interpret the effect of pH on soil organisms.

Background Information:

A property that is important to soil quality is pH. The pH is a measure of the acidity or basicity of a solution. Although pure rainwater has a pH of about 5.6, its pH will change when it enters soil. How it changes depends on the chemical characteristics of the soil. Some soils are called alkaline because they have a pH greater than 7; acid soils have a pH less than 7. Many plant nutrients found in soil, such as calcium and phosphorus, are more soluble under slightly acidic conditions. If a heavy rain occurs, these nutrients will dissolve in the soil water and can be washed away by moving down into lower soil layers where plant roots do not occur. The best soils are close to neutral, and not acidic or alkaline. If soils are too acidic or too alkaline, certain nutrients may be unavailable to plants.

Getting Ready:

The data collected from this activity can be kept in a notebook that can be used and analyzed over several years.

Procedure:

1. Locate the following three checkpoint areas on the school site
 - a. an area that you would like to improve or plant a garden,
 - b. an area where soil is undisturbed and naturally maintained (i.e. a forest), and
 - c. an area where soil is being damaged or eroded
2. Mark the areas on your school site map.
3. Divide the class into six groups.
4. At each area, have two groups gather the information for the activity.
5. Give each group the following:
 - a. Basic Soil Chemistry: pH worksheet
 - b. 3 beakers or plastic cups

Learners will:

6. Go to their assigned checkpoint area and walk two paces north, south, east, or west.
7. Record the location on their worksheet.
8. Collect (each group) three soil samples and place them into three separate cups or beakers. (There will be a total of 6 samples from each checkpoint area.)
9. Return to the classroom after each group has collected their three soil samples.

Location: Outside in several locations (garden, forest, field)

Objectives: Learners will

- 1) measure the pH of soil.
- 2) understand the effect of different soil pH on surrounding organisms.

Skills: data collection, observation, analysis, communication, inference

Supplies:

- pencils
- *Basic Soil Chemistry: pH Standards Check* data sheet
- three containers
- nine plastic cups
- a plastic rod for stirring soil (a plastic spoon will also work)
- distilled water
- pH paper
- measuring cup or graduated cylinder

Subjects: Science, Math

Time: 15 minutes (plus 15 minutes or more wait time to thoroughly wet the soil)

10. Using a measuring cup or graduated cylinder, add 100 ml of distilled water to each cup and using a different stirring rod (or spoon) for each cup, break apart the soil and stir mixing the water with the soil.
11. Leave the cups on a shelf for about three hours or until the water has become fairly clear. (Soils with heavy clay content may need to sit overnight).
12. Tear off a small strip of pH paper (about five cm or one inch long) and touch the paper to the water. Do not touch any soil.
13. Match the color of the wet pH paper to the colors found on the pH package. Record the pH number of the matching color. This is the pH of your soil.
14. Repeat this procedure for each container of soil.
15. Calculate the average pH values for each checkpoint site.
16. Record the pH of the soil at each site on the Standards Check data sheet.
17. Discuss the results and place your data sheet in your Logbook.

Discussion/Assessment:

Are there differences in soil pH between the various test locations on my site?
What are some factors that could affect soil pH?

Soil and Recycling Department
ECO-STANDARDS CHECK

BASIC SOIL CHEMISTRY: pH
LOOKING AT WATER pH

Team Members _____ Date _____ Time _____

Checkpoint # or Name _____ Direction (circle): N NE NW S SE SW E W

Weather Conditions: Temperature _____ Cloud Cover/Sun _____ Wind _____

Time: 10 minutes

INSTRUCTIONS:

1. Go to your assigned checkpoint area and walk two paces north, south, east, or west.
2. Collect three soil samples and place them into three separate cups or beakers.
3. Return to the classroom.
4. Add 100 ml of distilled water to each cup and using a different plastic rod (or spoon) for each cup, break apart the soil and stir mixing the water with the soil.
5. Leave the cups on a shelf for about three hours or until the water has become fairly clear.
6. Tear off a small strip of pH paper (about five cm or one inch long) and touch the paper to the water. Do not touch any soil.
7. Match the color of the wet pH paper to the colors found on the pH package. Record the pH number of the matching color. This is the pH of your soil.
8. Repeat this procedure for each beaker (cup) of soil (Samples 1, 2, and 3)
9. Calculate the average pH values for the three samples.
10. Record the average pH of the soil at each site.

Time: 10 minutes

	Checkpoint	Soil Description	Soil pH		Average pH
Data Collected From Your Group's Samples			Sample #1		
			Sample #2		
			Sample #3		

