Lesson Plans are provided to help organize an existing curriculum, allowing the teacher to spend more time on hands-on activities that meet key classroom learning objectives and improve student achievement. The Lesson Plans will aid the teacher in integrating LaMotte test kits and equipment into classroom activities that meet National Science Education Standards.
**Concept/Topic:**
Introduction to pH in soil and demonstration of a simple soil test procedure.

**Time Requirement:**
One class/lab period

**General Goals:**
The students will gain a basic understanding of pH in soil.

**Specific Objectives:**
1. Students will be able to explain why farmers and gardeners may have to add materials to soil to change the pH.
2. Students will be able to explain the pH scale.
3. Students will be able hypothesize, based on their test results, how Soil Sample A was different from Soil Sample B.
4. Students will be able to follow instructions and work together as a team.
5. Students will be able to make observations.
6. Students will be able to collect and analyze data, and draw a conclusion.

**Materials, Required**

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>5965</td>
<td>Classroom Studies, pH of Soil Lab</td>
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<tr>
<td>2-2146</td>
<td>Safety Goggles</td>
</tr>
<tr>
<td>2-2234</td>
<td>Gloves</td>
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<td>Timer/Clock</td>
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Anticipatory Set (Lead-In):
The pH of soil is a measurement that indicates whether the soil is acidic, neutral or basic. pH is measured on a scale which ranges from 0 to 14. A pH of 7 is considered neutral. Soils with a pH below 7 are acidic and soils with a pH above 7 are basic, or alkaline. Soil that is just right for most plants is equally acidic and alkaline. It has a pH between 6 and 8. Plants require many different nutrients from the soil to survive. Soil pH determines how easily the plants can use the nutrients. When the soil pH is outside the desired range, gardeners and farmers add materials to adjust the pH.

Preparation:
Read the manual to become familiar with the text and test procedures. Prepare and package a set of items for each of the 5 teams. Decide how to divide the students into 5 teams. Make a copy of the Student Procedures for each team.

Step-By-Step Procedures:
1. Divide students into 5 groups.
2. Present the Introduction lecture material.
3. Pass out a set of bagged items to each team.
4. Have members of each team decide on the duties of each member. For example, instruction reader, reagent adder, mixer, timekeeper, result recorder etc.
5. Read instructions aloud, one step at time, as students perform the Determining the pH of Soil procedure.
6. Discuss students' results.
Plan for Independent Practice:
Have students review additional information on pH and soil testing on websites included in the Resources section. Have students read and become familiar with Student Procedures.

Closure (Reflect Anticipatory Set):
Knowing the pH of soil is necessary for successfully growing plants. Plants have specific requirements for soil pH. Assuring the pH of the soil is correct for a specific crop will also insure that the plant receives the proper amount of nutrients if they are present. Soil that is not in the optimal pH range may contribute to the poisoning of the plant by allowing the plant to absorb toxic amounts of nutrients. If the correct conditions do not exist, it is possible to add material to the soil to adjust the pH.

Assessment Based on Objectives:
Have students:
- list factors that influence pH levels in soil.
- describe the pH scale.
- explain how soil pH is affected by lime, compost, ashes and coffee grounds.

Adaptations (For Students With Learning Disabilities):
- Provide written and verbal instructions for test procedures.
- Provide a copy of lecture material.
- Give students a copy of the Student Procedures ahead of time so they may become familiar with the instructions.

Extensions (For Gifted Students):
- Have students draw a pH scale using the color chart as a reference.
- Have students follow suggestions in the manual for Additional Experiments.
- Have students use terms in the Glossary to create a soil pH crossword puzzle.
- Have students research plant pH preferences and list them on the pH scale.
Possible Connections To Other Subjects:
Social studies—land use and urbanization

Resources:

**Literature**
- NASA Soil Science Education
  www.ltpwww.gsfc.nasa.gov/globe/
- Sci4kids
  www.ars.usda.gov/is/kids/soil/soilintro.htm
- National Gardening Association
  www.kidsgardening.com

**Equipment**
- LaMotte Company
  www.lamotte.com
  Review and order additional equipment
National Science Content Standards Addressed

A  Science as Inquiry
   All students should develop:
   • Abilities necessary to do scientific inquiry
   • Understanding about scientific inquiry

C  Life Science
   All students should develop understanding of:
   • Regulation and behavior
   • Population and ecosystems

D  Earth and Space Science
   All students should develop understanding of:
   • Structure of the Earth system

E  Science and Technology
   All students should develop:
   • Abilities of technological design