Lab: Seeing the Effects of Acid Rain

FOR THE TEACHER

Summary
In this lesson, students will prepare an environment and make acid rain to see how the acid rain effects the items in the environment.

Resource Type          Grade Level
Lab                      High school

Objectives
By the end of this lesson, students should be able to
- Understand how acid rain effects different components of the environment.

Chemistry Topics
This lesson supports students’ understanding of
- Acid base reactions
- Acid rain
- pH
- Chemical changes

Time
Teacher Preparation: 30 minutes
Lesson: one class period

Materials
- Petri dish
- Weighing tray
- Apple
- Strip of Mg
- Calcium carbonate
- Bromothymol blue (BTB)
- pH strip
- Litmus paper
- Water
- 3-M sulfuric acid
- Pipet
- 0.1-M sodium sulfide

Safety
- Always wear safety goggles when handling chemicals in the lab.
- When working with acids and bases, if any solution gets on your skin, alert your teacher and thoroughly flush your skin with water immediately.
- Be especially careful handling the 3-M sulfuric acid.
- Students should wash their hands thoroughly before leaving the lab.
• When students complete the lab, instruct them how to clean up their materials and dispose of any chemicals.

Teacher Notes
• Students could leave the acid rain set up overnight to observe the longer effects of the acid rain.
• Students could add additional items to the environment to see the effect of acid rain on those items.

FOR THE STUDENT

Student Activity Sheet: Seeing the Effects of Acid Rain

Lesson

Background
Acid rain is all around you, no matter where you go. You will see the actual effects acid rain has on our planet. You will simulate an environment in a Petri dish to see the effects of acid rain.

Materials

<table>
<thead>
<tr>
<th>Petri dish</th>
<th>Weighing tray</th>
<th>Apple</th>
<th>Strip of Mg</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

Procedure

_Complete each blank line with the chemical formula of the compound referred to._

1. Find a lab bench with a clean Petri dish. Make sure it is dry.
2. Place a weighing tray in the Petri dish. This is where you will make acid rain.
3. Cut a small piece of apple and place it in the dish.
4. Obtain a piece of polished magnesium and a green leaf. Place them in the dish.
5. Obtain a piece of calcium carbonate ____________. Place it in the dish. Drop a few drops of BTB on it. Make sure the calcium carbonate is in a puddle of BTB if the indicator beads off the rock.
6. Obtain a piece of pH paper and litmus paper (you may tear off smaller pieces from a whole strip). Place them in the dish. Add one drop of water to each of these papers.
7. Record your initial observations of each specimen in the Petri dish. Make sure to record the color of the BTB on the rock and the approximate pH indicated by the pH strip.
8. Time to make acid rain: in the weighing boat add five drops of 3-M sulfuric acid ____________ and 10 drops of 0.1-M sodium sulfide ____________. Place the top on the Petri dish and answer discussion questions (you can do 1-4 without any results). About 5 minutes before class is over, check your dish for more observations.
Discussion
1. Make sure you have filled in the blanks in the procedure with the chemical formulas of each of the chemicals.
2. If sodium hydroxide were added to the sulfuric acid solution, how much sodium hydroxide would it take to reach the equivalence point? Assume you start with 100 mL of 3-M sulfuric acid, and your sodium hydroxide solution is 2.5 M.
3. How was the 0.1-M sodium sulfide solution prepared? It was a 100 mL sample.
4. What kind of acid rain did you make? (Hint: there are two sources of it—one is an acid anhydride reaction...)
5. What happened to the pH paper and the litmus paper? Is this what you expected to happen? Explain.
6. Where do you find calcium carbonate in your environment? If your sample was left to sit longer in your dish, what do you think would eventually happen? Why?
7. What happened to the magnesium? Is this what you expected to happen? Explain.
8. What happened to the leaf? Is this what you expected to happen? Explain.

Conclusion
What did you learn from this lab?