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## Harmful Effects of Acid Rain

### Purpose

To demonstrate the harmful effects of an acidic solution. (Vinegar is a dilute solution of acetic acid.)

### Grade Level

7th grade

### Essential Elements

Environmental Essential Elements Across the Curriculum - 75.25 (2) Acquire data through the senses. The student shall be given opportunities to (B) observe properties and patterns of objects, organisms, and events in the environment.

(4) Communicate data and information in appropriate oral and written form. The student shall be given opportunities to (B) describe objects, organisms, and events from the environment, (D) describe changes that occur to objects and organisms in the environment.

### Objective

The student will become aware of the harmful effects of acid rain.

### Background

Acid rain is more acidic than normal rain and forms through a complex process of chemical reactions involving air pollution. The two most important pollutants that contribute to the formation of acid rain are oxides of nitrogen and sulfur dioxide, which react with moisture in the atmosphere to form nitric and sulfuric acid. The sulfur and nitrogen compounds that contribute to acid rain primarily come from man-made sources, such as industries and utilities. Emissions also come from automobiles and other forms of transportation and industrial processes, such as smelting.

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Acid rain can harm forests and crops, damage bodies of water, and contribute to the damage of statues and buildings. Researchers are considering the possible effects of acid rain on human health. These acidic pollutants can be deposited through rain, snow, fog, dew, or sleet. Large quantities can also be deposited in a dry form through dust.

Pollutants that contribute to acid rain may be carried hundreds of miles before being deposited on the earth. Because of this, it is sometimes difficult to determine the specific sources of these acid rain pollutants.

## Materials

- vinegar
- water
- 2 medium sized eggshell pieces
- 2 small green leaves
- two paper clips
- two containers with lids

## Procedure

1. Before activity, make predictions. If vinegar contains acid, then how will some items placed in vinegar change? If these items were placed in water, would they change in the same ways as in vinegar?
2. Pour vinegar in one container. Place an eggshell piece, a leaf, and a paper clip in the container. Put the lid on the container.
3. Pour water in the other container. Place an eggshell, a leaf, and a paper clip in this container. Put the lid on the container.
4. Let the two sealed containers sit overnight.
5. Remove the container lids. Observe any changes that took place in the two containers. Write down observations.

## Results

In the container of water, the items will not show noticeable changes. In the container of vinegar, the eggshell will be soft, the leaf will have brown spots on it, and the paperclip will not show a noticeable change. This activity indicates that acidic solutions can be harmful.

## Extensions

Measure the acid in several solutions using inexpensive pHHydrion papers (pH papers). Suggestions for solutions to be tested are:

- lemon juice (pH of 2.0)
- vinegar (2.2)
- apple juice (3.0)
- tomato juice (4.2)
- milk (6.2)
- pure water (7.0)

Compare the solution pH values with acid rain (below 5.6) and normal rain (above 5.6). Explain that some foods we eat have healthy acids like citric acid, which is not harmful. However, there are stronger acids, which are the products of factories and industries, that are harmful.

## Resource

*Ecology Science Notes*, Frank Schaffer Publications, Inc.

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## Acknowledgment

Peggy Matthews, Texas A&M Corpus Christi TES Course, 1996

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