

Acid Rain: An Air Pollutant



Target Grade Levels

Fourth - Sixth

Time

30 minutes in first class

40 minutes in second class with guest presenter

Materials

- chalk
- vinegar
- glasses for each group

Knowledge and Skills (TEKS)

- Science:
 - Acquire data through the senses;
 - The student shall be given opportunities to observe properties and patterns of objects, organisms and events in the environment; and
 - The student shall be given opportunities to describe objects, organisms and events from the environment, describe changes that occur to objects and organisms in the environment.
- Language Arts:
 - Communicate data and information in appropriate oral and written form.

Overview

To demonstrate the effect of acid rain on statues and buildings.

Background Information

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 nitrogen oxide 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 manmade sources, such as industries, utilities, automobiles, and other forms of transportation and industrial processes, such as smelting.

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.

Procedure

1) Vocabulary

- | | |
|--------------|--------------------|
| a) acid | d) acetic acid |
| b) base | e) nitrogen oxides |
| c) limestone | f) sulfur dioxide |

2) Activities

- a) Acids react chemically with bases. Many culturally significant statues and buildings are made from limestone, which is a base.

- b) Explain that vinegar is an acid and chalk is processed limestone.
- c) Fill a glass 1/3 full with vinegar for each group.
- d) Add a piece of chalk to the glass.
- e) Have the students write about what they see happening in the experiment.
- f) Discuss their observations and inferences.
- g) Add corrected notes to notebook.
- h) Discuss the slow deterioration of statues and buildings due to the weak acid rain that falls on some statues and buildings. If the stone is limestone or has limestone in it, the deterioration is more rapid.

3) Review

- a) Discuss what buildings or important edifices (such as the Alamo) in the region are made of limestone and how they might be affected by acid rain.
- b) Discuss and encourage students to brainstorm acid rain's other effects, concentrating on the importance of pH in aquatic and soil ecosystems.

4) Evaluation

Extension activities can be performed as graded exercises.

5) Extension

- a) See the Acid Rain "Information, Activities and Data" page for suggested activities using acid rain data collected by the Texas Commission on Environmental Quality.
- b) Gather pictures of examples of acid rain (chemical weathering).
- c) Research effects of acid rain on great art works.
- d) Research causes of acid rain.
- e) Suggest solutions to the problem of acid rain.

Adapted from: "Acid Rain: An Air Pollutant" *Texas Commission on Environmental Quality*.
www.tnrcc.state.tx.us/air/monops/lessons/lesson_plans.html.

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