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Air Pollution: Visible and Invisible

Purpose

To try and tell the difference between visible and invisible air pollution.

Grade Level

4th grade

Science TEKS

- 4.1 a, b
- 4.2 c, d

Objective

The learner will test for visible and invisible pollutants in the air. The learner will keep a journal of experimental procedures, results, and conclusions.

Focus

Ask each student, "What is air pollution?" Write all ideas on the board. Through discussion, arrive at one definition. Divide students into groups to brainstorm things that pollute the air. Have groups take turns recording ideas on an air pollution chart posted in the room.

Materials

- chart paper
- measuring cups

For each group you will need:

- small glass jar
- large glass jar
- petroleum jelly
- 3 bean plants approximately the same size
- tap water

- vinegar
- vinegar-water mixture in 1 to 3 ratio
- pH paper or indicator

Background

The atmosphere is almost completely made up of invisible gaseous substances. Most major air pollutants are also invisible, although large amounts of them concentrated in areas such as cities can be seen as smog. One often visible air pollutant is particulate matter, especially when the surfaces of buildings and other structures have been exposed to it for long periods of time or when it is present in large amounts. Particulate matter is made up of tiny particles of solid matter and/or droplets of liquid. Natural sources include volcanic ash, pollen, and dust blown by the wind. Coal and oil burned by power plants and industries and diesel fuel burned by many vehicles are the chief sources of man-made particulate pollutants, but not all important sources are large scale. The use of wood in fireplaces and wood-burning stoves also produces significant amounts of particulate matter in localized areas, although the total amounts are much smaller than those from vehicles, power plants, and industries.

Procedure

- Divide the ideas from the air pollution chart into two groups of pollutants: visible and invisible.
- In groups, students will set up experiments to test both visible and invisible pollutants.
- Each student must keep a record of the experiments in their journal. Both experiments can be set up and run at the same time.

Visible Pollutants Experiment

1. Smear petroleum jelly on the small jar.
2. Carefully place inside large jar.
3. Decide on several places around the school where students think visible pollutants will occur. Each group should have a different area to test. Make predictions about which area will have more visible pollutants and why. Record predictions in journal.
4. Place jars in test areas for several days. Have the groups check the jars daily. Record observations in journal.
5. Bring jars to class for comparison. Observe and rank the jars from the one with the most visible pollutants to the one with the least. Assign each jar a number. Discuss why certain areas have more visible pollutants than others.
6. Mark a school map showing the ranking of areas from #5. Display the map in the hall for others to see.

Invisible Pollutants Experiment

1. Divide the class into three groups. Each group sets up a bean plant garden with three containers, each container having one bean plant each.

2. Students determine and compare the pH of the three solutions and predict how the plants will be affected by each solution. Record pH and predictions in journal.
3. Plants will be watered every day with 1/8 to 1/4 cup of a solution: one plant with tap water, one plant with straight vinegar, and one plant with the vinegar-water mixture. Procedure is recorded in journal.
4. Observe plants daily. Record in journal what happens to each plant. Sketches may be part of the observations.
5. Compare plants and discuss observations at the end of a day, week, two weeks, or until plants die.
6. Using the observations of all groups, write a class conclusion for this experiment. Record in journal.
7. Arrive at the idea that the invisible pollutants experiment was about acid rain.

Enrichment

Research the history of acid rain. Include information on the causes of acid rain, when we first became aware of the problem, what problems have been caused by acid rain, what measures have been taken to combat acid rain. Has the situation improved?

Make a class mural to show the acid rain cycle.

Post a chart for the causes of visible pollutants and what can be done to prevent them. Leave the chart up so students can add to it whenever they have an idea.

Acknowledgment

Maclyn Jones, Texas Southern University Houston TES Course, 1995