

# AIR STRIPS\*



AIR & WASTE MANAGEMENT  
ASSOCIATION

## OBJECTIVES

The student will do the following:

1. Define particulate matter.
2. Collect particulate matter from the air in test areas around the school.
3. Analyze the particles collected and draw conclusions about the airborne particulate pollutants.

### SUBJECT:

Science

### TIME:

2 class periods (one week apart)

### MATERIALS:

posterboard or cardboard

scissors

rulers

clear tape

string

magnifying glasses

hole punch

permanent markers

Optional: compasses, dissecting

microscope, balance

student sheet (included)

## BACKGROUND INFORMATION

Our atmosphere is almost completely made up of invisible gaseous substances. Most major air pollutants are also invisible gaseous substances, although large amounts of them concentrated in areas such as cities can be seen as smog. However, one easily 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 particulate matter tends to be less of a problem to human health and the general well-being of the environment than that which is man-made. Natural sources include volcanic ash, pollen, and dust blown about 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 rather significant amounts of particulate matter in localized areas, although the total amounts are much smaller than those from vehicles, power plants, and industries.

Particulate air pollutants can be harmful to plant life and to animal and human life when the pollutants are inhaled. Discoloration of buildings and other structures is also caused by particulate pollutants; this is unsightly and quite expensive to clean up. Because it can have harmful and serious effects, particulate matter is one of the six criteria pollutants—a pollutant for which the government has established laws and air quality standards.

\* This activity was adapted from the "Science and Technology Week Poster," distributed by the Needham Science Center, Needham, Massachusetts.

## PROCEDURE

### I. Setting the Stage

- A. Ask the students how we know air pollution exists. Are air pollutants visible? Invisible?
- B. Have the students give some examples of visible air pollutants. (They will probably list smoke, dust, smog, and others.)
- C. Define particulate matter for the students and share with them "BACKGROUND INFORMATION."

### II. Activity

#### A. Construction of air strips.

1. Give each student a copy of the student sheet "AIR STRIP" (included). Provide the materials to make the strips and have the students follow the directions on the sheet. Make an air strip for yourself. Use this strip to show the students how their finished products should look, then use it as a control in part C for comparison with the test strips exposed to the air for 1 week. NOTE: Each student should make at least one air strip, more if there is time.
2. (OPTIONAL) Have the students measure the mass (weight) of the air strips (including the control strip) as accurately as possible on a balance. If you choose to do this step, explain that the mass of the strips will be measured again after the week of exposure. NOTE: Control strip weighing at beginning and end will tell the students how much of the difference is caused by increase or decrease in humidity. Add or subtract weight change of control strip to last weight of each test strip.

#### B. Location of air strips.

1. Have the students hang the strips at different places around the school, both inside and outside. Inside the school, hang strips in the halls, cafeteria, bathrooms, shop, gym, labs, and/or kitchen. Outside, hang strips in trees, along main walks, and at all entrances of the school. Give each student tape to secure the air strip's string to a stable surface at the selected sites. The air strips should be able to move freely without bumping other surfaces. NOTE: All air strips should be carefully labeled with date, location, and student's name.
2. After one week, have the students collect the strips. Tell them to be careful not to touch the sticky side of the tape.

#### C. Analysis of air strips.

1. Have the students visually compare the control air strip to the air strips used to collect particulate matter.
2. (OPTIONAL) Have each student measure the mass of his/her air strip and compare it to the mass of the air strip before the collection of particulate matter. (See note in A.2.)
3. Distribute magnifying glasses and have the students try to identify as many particles on the tape as possible. Dust, ash, soot, and/or other particles may be present. Depending upon the time of year, pollen may also have been collected. (OPTIONAL: You may choose to have the students use dissecting microscopes instead of, or in addition to, magnifying glasses.)

- D. Ask the students to draw conclusions about the particulate air pollutants in the test areas. Are there differences in the particles based on where the air strips were placed?

### III. Follow-Up

Have each student develop a chart or graph using the information gathered by the class and write a summary paragraph about the activity.

### IV. Extension

- A. Place air strips in a variety of other places for a week: other schools, homes, churches, stores, urban and rural areas, factories, the bumpers of cars or school buses, on roofs, or in basements. Have the students compare the particulates collected from the different areas.
- B. Post new air strips daily and compare them to determine if the day of the week makes a difference in the amount of particulate matter collected. Have the students consider such possible factors as the weather, wind direction, and industrial or business schedules for the days examined. (This can lead to a discussion of particulate matter pollution sources.) NOTE: If the students are examining daily influences, they need to keep daily records when they hang the air strips.

## RESOURCES

Manahan, Stanley E. Environmental Chemistry. 4th ed. Monterey, CA: Brooks Cole, 1984.

Masteron, William L., E. J. Slowinski, and C.L. Stanitski. Chemical Principles. 6th ed. Philadelphia: Saunders, 1985.

**AIR STRIP****Directions:**

1. Using a ruler to measure, cut a strip of posterboard or cardboard that is 2 inches wide and 10 inches long.
2. Cut 5 holes, each about an inch in diameter, in the strip. Use the ruler to find a round object of the right diameter or use a compass to draw the circles. (NOTE: A quarter is about 1 inch in diameter.)
3. Use a hole punch to put a small hole in one end of the strip. Tie a string through the hole; the string will be used to hang the strip at a selected site.
4. Put a long piece of clear tape over one side of the strip. Be sure to completely cover all 5 holes. (Depending upon the width of the tape, you may need 2 or more pieces.) The sticky side of the tape will collect particulate matter from the air. Make sure you do not touch the sticky side of the tape over the holes.
5. Before hanging the air strip at a selected site, use a permanent marker to write on the top edge of the strip the date, location, and your name.

