PRELIMINARY ACTIVITY FOR

Measuring Particulates

Air pollution affects everyone. It comes in various forms including emitted gases, ozone, and particulate matter. Short-term exposure to air pollution can result in throat and eye irritation as well as difficulty breathing. Prolonged exposure to particulate pollution can result in chronic health concerns, such as cancer and damage to the body's immune, neurological, reproductive, and respiratory systems. Those most susceptible include the elderly, children, and people with asthma. There are guidelines in place to alert people to days during which the air pollution levels may be high.

Particulate matter consists of a mixture of particles ranging from large particles such as smoke, dust, and pollen to smaller ones from vehicle exhaust and coal-fired plants. The major contributors of particulates to the air you breathe include coal and oil burning power plants, diesel engines, and wood-burning fireplaces. Natural sources of particulate matter include volcanic ash, pollen, and dust. The amount of particulate matter in the air can be measured using various techniques. One technique uses a device that collects particles on a filter strip and periodically shines light through the strip to record the difference in light transmittance. This difference correlates to the particle mass collected over a period of time. You will use a similar technique.

You will measure the amount of light that passes through a test card that has been allowed to collect particulate matter from the air for a week or longer. You will compare the transmittance of light through test cards to light transmittance through a control card.

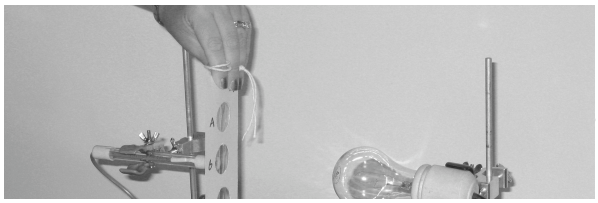
In the Preliminary Activity, you will make a particulate test card and gain experience using a Light Sensor while determining light transmittance through the test card.

After completing the Preliminary Activity, you will first use reference sources to find out more about particulate air pollutants before you choose and investigate a researchable question. Some topics to consider in your reference search are:

- particulates
- air pollution
- primary pollutants
- dust dome
- temperature inversion
- Clean Air Act

PROCEDURE

1. Prepare a particulate test card.
   a. Obtain a 2.5 × 8 inch (6.4 cm × 20.3 cm) index card.
   b. Using the coin as your guide, draw four circles on the test card in the locations shown in Figure 1.
   c. Label the circles A – D.
   d. Use scissors to cut out the circles. Cover the holes with one large piece of clear packing tape. Tape it so that the sticky side of the tape shows through on the side of the card with the labels.



2. Set the Light Sensor switch setting to the 0-6000 lux range. Connect the Light Sensor and the data-collection interface.
3. Prepare for data collection.
   a. Clamp a lamp fitted with a 100 W bulb to one ring stand using a utility clamp.
   b. Clamp the Light Sensor to the other ring stand using a second utility clamp.
   c. Position the clamps so that the Light Sensor is the same height as the center of the bulb.
   d. Point the Light Sensor directly at the bulb.
   e. Move the ring stands so that the Light Sensor is approximately 15 cm from the bulb.
4. Turn on the lamp. Hold the test card in front of the Light Sensor so that sample circle A is directly in front of the sensor as shown in Figure 1.
5. Start data collection and collect data for 10 seconds. Use the Statistics function to determine the mean illumination. Record the illumination value (in lux).
6. Repeat Step 5 for the other circles, and then determine the average illumination for the four circles.

QUESTIONS

1. What were the four illumination values that you obtained in the Preliminary Activity?

2. Calculate the average illumination.

3. Identify three possible sources of particulate pollution in your community.

4. List at least one researchable question for this experiment.