

APES LAB ~ AIR POLLUTION

WHAT TO TURN IN:

Data Table

Questions 1-8

Objectives

- To illustrate the relationship between air pollution and combustion of various materials.
- To see how society and industry add potentially harmful pollutants to the air.
- To see the difference between the air pollutants given off from the combustion of natural and of synthetic materials.
- To realize that the individual is a source of air pollution.
- To better appreciate that, by altering consumer buying practices, air pollution be reduced.

Materials

FUME HOOD

600 mL beakers

matches

foil

tiles

turpentine or ethanol

cotton balls

cotton fabric

pieces of wood

nylon fabric

polyester fabric

plastic code 1

plastic code 2

plastic code 6 (Styrofoam)

rubber bands

vinyl sheeting

rayon fabric

silk fabric

wool

Introduction

Five major types of materials are considered to be primary pollutants. Carbon monoxide (CO), a colorless gas, is produced when organic material such as gasoline, coal, wood, and trash is incompletely burned. Smoking tobacco also produces large amounts of CO. In addition to CO, automobiles emit a variety of hydrocarbons (HC). Hydrocarbons are either evaporated from fuel supplies or are remnants of the fuel that did not burn. Particulates (PM) constitute the third largest category of air pollutants. Particulates frequently receive a great deal of public attention because they are so readily visible. Sulfur dioxide (SO₂) is a compound containing sulfur and oxygen that is produced when sulfur-containing fossil fuels are burned. SO₂ has a sharp odor and irritates respiratory tissue. Oxides of nitrogen (NO and NO₂) are the fifth type of primary air pollutants. Nitrogen compounds produce a reddish brown color in the atmosphere and react with other compounds to produce photochemical smog.

Air pollution can be detected and in some cases diagnosed by using the senses of sight, smell, and touch. In this exercise you will produce various primary air pollutants in small quantities and observe their by-products.

Lab Procedure

* Make sure there is adequate ventilation and observe fire safety rules.*

- 1) Cover a ceramic tile with foil. (The foil can be changed if it gets soiled later.)
- 2) Place a small wad of cotton on the tile.
- 3) Using a match, light the cotton and cover the tile with a 600 mL beaker. If the flame begins to go out before the cotton is fully burned, lift the edge of the beaker slightly to let in more air. Observe the products of combustion.
- 4) When the flame goes out, study the beaker and its contents for several minutes. Record observations in the air pollution data table. Take the beaker to the fume hood and allow fumes to escape.
- 5) Clean the beaker.
- 6) Use a fresh wad of cotton. With a medicine dropper, place two drops of turpentine or ethanol on the cotton. Repeat the procedures for burning and observation discussed in steps 1-5. Enter your observations in the air pollution data table.
- 7) Repeat the same procedures for the burning of wood, various fabrics, rubber, and plastics. Enter the data in the table.
- 8) Repeat the same procedures with any other materials suggested by your instructor.

AIR POLLUTION DATA TABLE

<u>Material</u>	<u>Natural or synthetic?</u>	<u>Smoke Color</u>	<u>Smoke Odor</u>	<u>Appearance of Residue / Ash</u>	<u>Other Observed Products</u>	<u>Other Observations (burning rate, noise, etc.)</u>
Cotton ball						
Cotton ball + Ethanol						
Cotton cloth						
Wood						
Nylon						
Polyester						
Rayon						
Silk						
Wool						
Plastic (code 1)						
Plastic (code 2)						
Plastic (code 6: Styrofoam)						
Rubber						
Vinyl						

Questions

- 1) a) Which of the materials gave off the most air pollution?
b) On what do you base your answer?
- 2) a) Did any of the substances, when burned, produce liquid inside the beaker?
b) If so, what color was the liquid?
- 3) a) Did you find any solid pollutants being given off by combustion of any of the materials?
b) If so, describe what you saw.
- 4) Which of the products—synthetic or natural—seemed to give off more pollutants in solid and gaseous form?
- 5) What additional experiments would you do in order to answer questions 1-4 more completely?
- 6) a) What pollutants do you think you have added to the air so far today?
b) Can you think of alternative ways of carrying out the day's activities so you pollute air less?
- 7) a) What potentially harmful pollutants are added by autos, coal power plants, nuclear power plants?
b) What are some alternatives to these activities that might produce fewer air pollutants?
- 8) a) What is a "synergistic effect"?
b) What effect do you feel synergism has in air pollution?