

Lesson A4–1

Defining Air Pollution and its Effect on Humans

Unit A. Natural Resources

Problem Area 4. Air

Lesson 1. Defining Air Pollution and its Effect on Humans

New Mexico Content Standard:

Pathway Strand: Natural Resources and Environmental Systems

Standard: VIII: Understand environmental service systems.

Benchmark: VIII-A: Understand pollution control measures to maintain a safe facility environment.

Performance Standard: 1. Identify types of pollution (e.g. ground, surface water, air, noise, radioactive contamination). 2. Describe environmental impact from industrial and non-industrial processes.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the meaning of air pollution.
2. List the major components of air.
3. Explain the effects of air pollution on humans.

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Porter, Lynn, Jasper S. Lee, Diana L. Turner, and Malcolm Hillan. *Environmental Science and Technology, 2nd Edition*. Upper Saddle River, New Jersey: Prentice Hall Interstate, 2003. (Textbook and Activity Manual, Chapter 19)

Other Resources. The following resources will be useful to students and teachers:

Cooper, Elmer L. and L. DeVere Burton. *Agriscience: Fundamentals & Applications*. Albany, New York: Delmar, 2002. (Unit 7).

Lee, Jasper S. *Natural Resources and Environmental Technology*. Danville, Illinois: Interstate Publishers, Inc., 2000. (Chapter 10).

Lee, Jasper S. and Diana L. Turner. *Introduction to World AgriScience and Technology*. Danville, Illinois: Interstate Publishers, Inc., 1997. (Textbook and Activity Manual, Chapter 3).

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Chapter 19 and 10

Terms. The following terms are presented in this lesson (shown in bold italics):

Air
Air pollutant
Air pollution
Alveoli
Ambient air

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Hold up a clear zip top plastic bag that you have sealed after blowing into it in front of the class. Ask the students to identify the contents of the bag. Expected answers would be “nothing” or “the bag is empty.” A possible response would be “Really, then why can’t I push the sides together?” When students give the response that the bag contains air, lead discussion to the definition and properties of air.

Summary of Content and Teaching Strategies

Objective 1: Explain the meaning of air pollution.

Anticipated Problem: What is air pollution

- I. **Air** is the invisible, tasteless, and odorless mixture of gases that surrounds us. The mass of air that surrounds the earth forms the atmosphere. The availability of quality air is critical to both plants and animals. Without an adequate amount of clean air, both would die. **Air pollution** is the presence of materials in the air that damage air quality. Much of the air pollution is a result of human activity, however, some results from natural events, such as volcanic action or the decay of organic materials. An **air pollutant** is any material that causes air pollution. Air can be divided into two basic categories:
 - A. Ambient air—**Ambient air** is the air or atmosphere outside. This is the air that is most important in air quality. The quality of ambient air is affected by the materials released into it from various sources.
 - B. Inside air—This category, as the name suggests, includes the air found inside buildings. The quality of air found inside of buildings is of great importance as well since most people spend a larger portion of their day breathing inside air than ambient air.

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding the meaning of air pollution. Chapter 19 in Environmental Science and Technology is recommended.

Objective 2: List the major components of air.

Anticipated Problem: What are the major components of air?

- II. The air contains a relatively consistent mix of gases in all places. Some variation of this mix may be found bas on the local environment. The greatest concentration of gases is near the surface of the earth. As elevation increases, the air decreases in density or becomes “thinner.” About 95 percent of the total air mass is within 12 miles of the earth. Some of the major gases found in air are:
 - A. Nitrogen (N)—78 percent
 - B. Oxygen (O)—21 percent
 - C. Carbon dioxide (CO₂)—.03 percent
 - D. Argon—less than 1 percent
 - E. Other gases including hydrogen, helium, and neon—less than 1 percent

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in learning major components of air. Chapter 10 in Natural Resources and Environmental Technology is recommended. Use TM: A4–1A to aid in the discussion.

Objective 3: Explain the effects of air pollution on humans.

Anticipated Problem: What are some of the effect of air pollution of humans?

- III. A variety of human health problems are related to air pollution. Most are respiratory diseases. Some of the more common diseases that can be related to air pollution include lung cancer, emphysema, bronchitis, and black lung disease. These diseases, as well as others, can occur when pollutants are inhaled. When in the lungs, the pollutants interfere with the exchange of gases. The area inside the lungs where gases are exchanged is large and contains many tiny alveoli. **Alveoli** are air-containing cells found in the lungs. It is the thin membranes between the alveoli and blood vessels where gas exchange occurs. Some pollutants increase the liquid in the lungs and impair the exchange of gases.
- A. The human body does have a few natural defenses against air pollutants. The first point where air is cleansed before reaching the lungs is the nostrils. The nostrils have small hairs and moist membranes that filter dust and some gases. Materials that get past the small hairs may be absorbed by the mucous membranes. They become trapped and are then either blown out or swallowed.

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding the effects of air pollution on humans. Chapter 19 in Environmental Science and Technology is recommended. Use TM: A4–1B to aid in the discussion.

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at end of chapters in the textbook may also be used in the review/summary.

Evaluation. Use the following sample test to evaluate the students' comprehension of the objectives covered in this lesson.

Answers to Sample Test:

Part One: Matching

1 = f, 2 = e, 3 = h, 4 = d, 5 = g, 6 = a, 7 = b, 8 = c

Part Two: Completion

1. nostrils
2. 95
3. natural

Part Three: Short Answer

Possible answers include lung cancer, emphysema, bronchitis, and black lung disease.

Test

Lesson A4–1: Defining Air Pollution and its Effect on Humans

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | |
|------------------|-------------------|
| a. Air | e. Nitrogen |
| b. Air pollutant | f. Alveoli |
| c. Oxygen | g. Carbon dioxide |
| d. Air pollution | h. Ambient air |

- _____ 1. Air-containing cells found in the lungs.
- _____ 2. Approximately 78 percent of all ambient air.
- _____ 3. The air or atmosphere outside.
- _____ 4. The presence of materials in the air that damage air quality.
- _____ 5. Approximately .03 percent of all ambient air.
- _____ 6. The invisible, tasteless, and odorless mixture of gases that surrounds us.
- _____ 7. Any material that causes air pollution.
- _____ 8. Approximately 21 percent of all ambient air.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

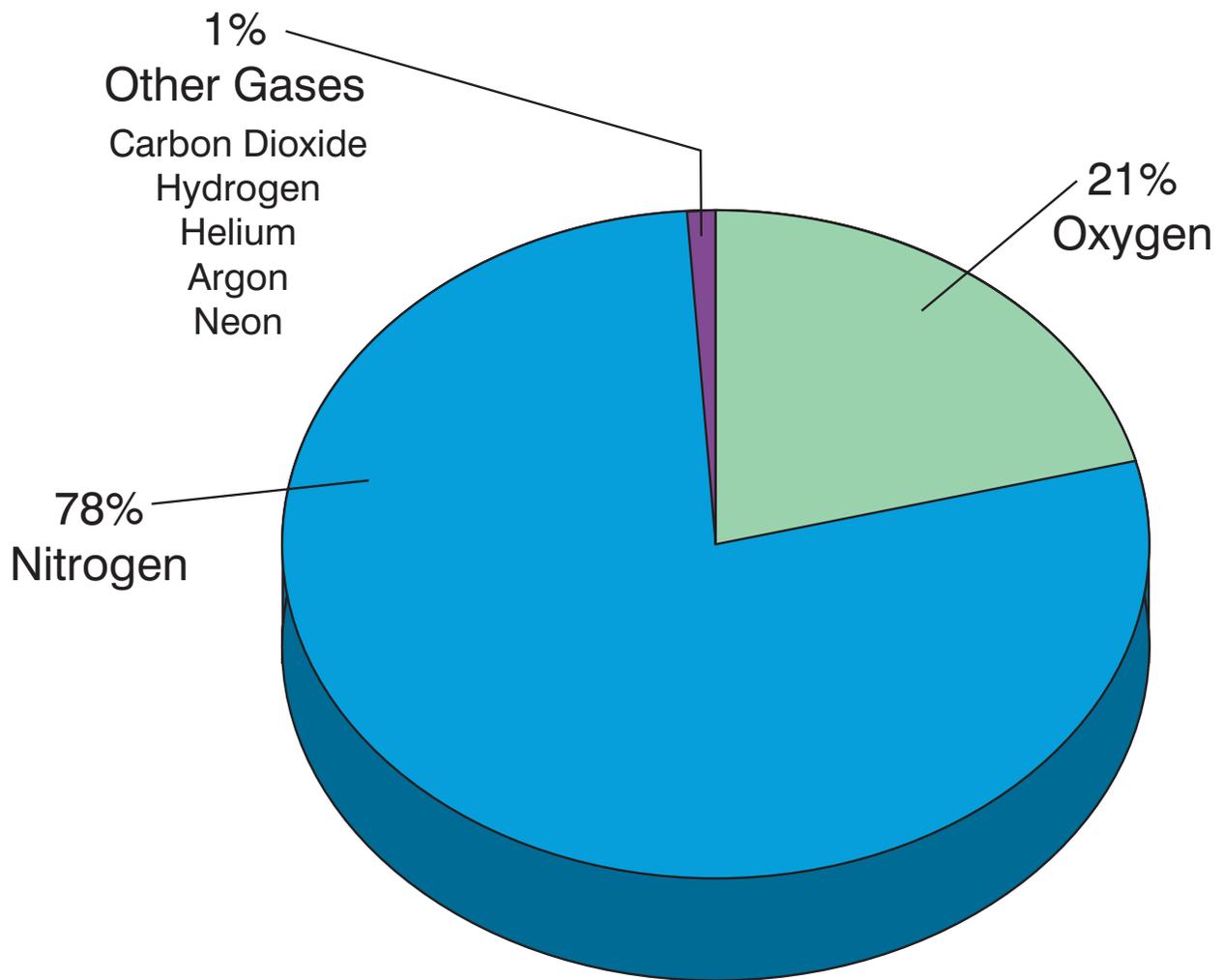
1. The _____ have small hairs and moist membranes that filter dust and some gases.
2. About _____ percent of the total air mass is within 12 miles of the earth.
3. Much of the air pollution is a result of human activity, however, some results from _____ events.

Part Three: Short Answer

Instructions. Provide information to answer the following question.

Name three respiratory disease that can be caused by air pollution.

MAJOR COMPONENTS OF AIR



EFFECTS OF AIR POLLUTION ON HUMAN HEALTH

