Section 1

# The Respiratory System

## Reading Preview

### Key Concepts

- What are the functions of the respiratory system?
- What structures does air pass through as it travels to the lungs?
- What happens during gas exchange and breathing?

### Key Terms

- respiration • cilia • pharynx
- trachea • bronchi • lungs
- alveoli • diaphragm • larynx
- vocal cords

### Target Reading Skill

**Sequencing** As you read, make a flowchart that shows the path of air in the respiratory system. Write each step of the process in a separate box in the order in which it occurs.

**Path of Air**

Air enters the nose.

↓

To the pharynx

↓

## Lab zone Discover Activity

### How Big Can You Blow Up a Balloon?

1. Take a normal breath, then blow as much air as possible into a balloon. Twist the end and hold it closed. Have your partner measure around the balloon at its widest point.
2. Let the air out of the balloon. Repeat Step 1 and calculate the average of the two measurements.
3. Compare your results with those of your classmates. The bigger the circumference, the greater the volume of air exhaled.

**Think It Over**

**Inferring** What factors might affect the volume of air a person can exhale?

Jerry, the main character in Doris Lessing's story "Through the Tunnel," is on vacation at the seaside. Day after day, he watches some older boys dive into deep water on one side of a huge rock. The boys mysteriously reappear on the other side. Jerry figures out that there must be an underwater tunnel in the rock. He finds the tunnel beneath the water and decides to swim through it. Once inside, though, he is terrified. The walls are slimy, and rocks scrape his body. He can barely see where he is going. But worst of all, Jerry has to hold his breath for far longer than ever before. The author describes Jerry this way: "His head was swelling, his lungs were cracking."

**Hold your breath!**

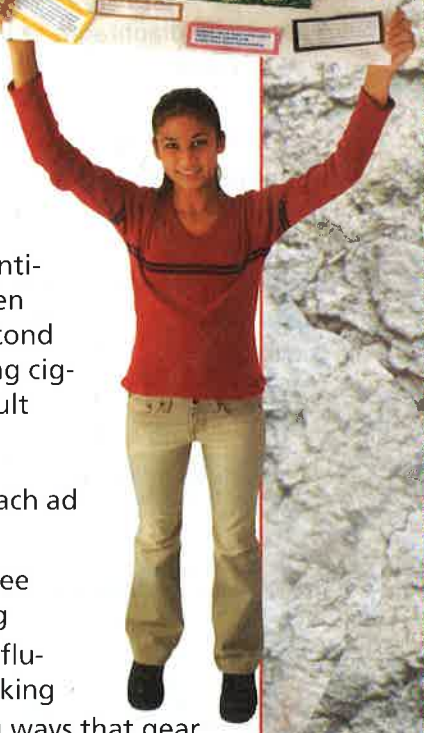
Discovery Channel SCHOOL

*Respiration and Excretion*
- Video Preview
- Video Field Trip
- Video Assessment

Lab zone™ **Chapter Project**

## Get the Message Out

Imagine that you're part of a team of writers and designers who create advertisements. You've just been given the job of creating anti-smoking ads for different age groups. As you read this chapter and learn about the respiratory system, you can use your knowledge in your ad campaign.



**Your Goal** To design three different anti-smoking ads: one telling young children about the dangers of smoking, the second one discouraging teenagers from trying cigarettes, and the third encouraging adult smokers to quit

To complete this project successfully, each ad must

- accurately communicate at least three health risks associated with smoking
- address at least two pressures that influence people to start or continue smoking
- use images and words in convincing ways that gear your message to each audience

**Plan It!** Brainstorm a list of reasons why people smoke. Consider the possible influences of family and friends as well as that of ads, movies, videos, and television. Also, decide which types of ads you will produce, such as magazine ads or billboards. After your teacher approves your plan, begin to design your ads.

## Respiratory System Functions

No one can go for very long without breathing. Your body cells need oxygen, and they get that oxygen from the air you breathe. **The respiratory system moves oxygen from the outside environment into the body. It also removes carbon dioxide and water from the body.**

**Taking in Oxygen** The oxygen your body needs comes from the atmosphere—the mixture of gases that blankets Earth. Your body doesn't use most of the other gases in the air you breathe in. When you exhale, most of the air goes back into the atmosphere.

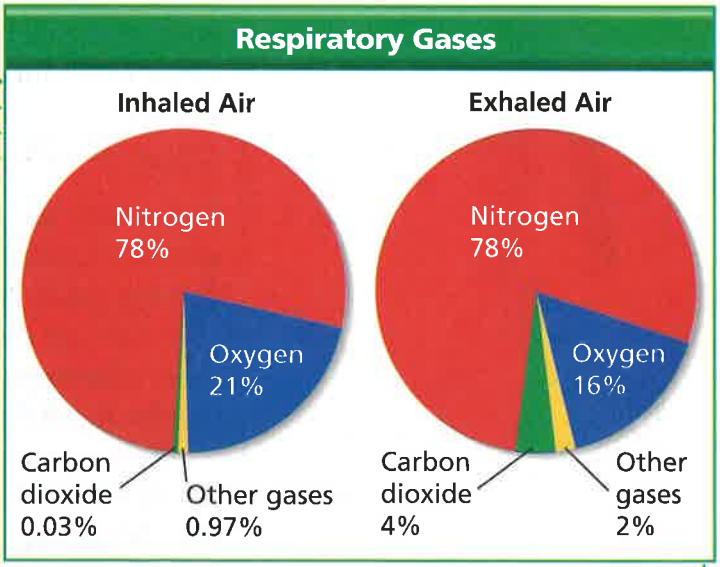
Oxygen is needed for the energy-releasing chemical reactions that take place inside your cells. Like a fire, which cannot burn without oxygen, your cells cannot "burn" enough fuel to keep you alive without oxygen. The process in which oxygen and glucose undergo a complex series of chemical reactions inside cells is called **respiration.** Respiration, which is also called cellular respiration, is different from breathing. Breathing refers to the movement of air into and out of the lungs. Respiration, on the other hand, refers to the chemical reactions inside cells. As a result of respiration, your cells release the energy that fuels growth and other cell processes.

**Removing Carbon Dioxide and Water** In addition to the release of energy, respiration produces carbon dioxide and water. Your respiratory system eliminates the carbon dioxide and some of the water through your lungs.

**Math** Analyzing Data

### The Air You Breathe

The air you breathe in contains several different gases, shown in the circle graph on the left. The air you breathe out contains the same gases, but in the amounts shown in the circle graph on the right.

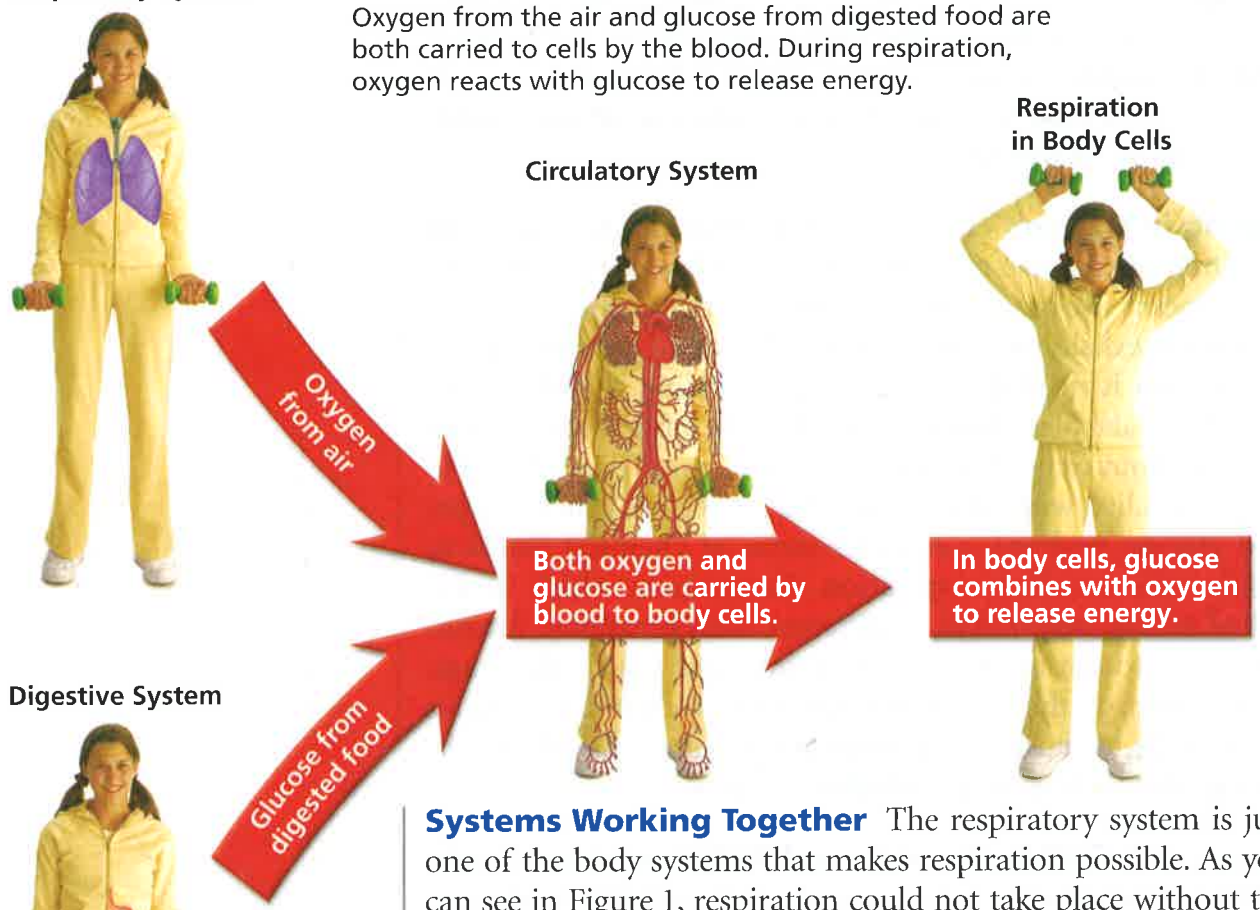



1. **Reading Graphs** What does each wedge in the graphs represent?
2. **Interpreting Data** Based on the data, which gas is used by the body? Explain.
3. **Drawing Conclusions** Compare the percentage of carbon dioxide in inhaled air with the percentage in exhaled air. How can you account for the difference?
4. **Inferring** Explain why the percentage of nitrogen is the same in both inhaled air and exhaled air.

FIGURE 1

## Fueling Your Cells

Oxygen from the air and glucose from digested food are both carried to cells by the blood. During respiration, oxygen reacts with glucose to release energy.




**Systems Working Together** The respiratory system is just one of the body systems that makes respiration possible. As you can see in Figure 1, respiration could not take place without the digestive and circulatory systems as well. Your respiratory system brings oxygen into your lungs. Meanwhile, your digestive system absorbs glucose from the food you eat. Then, your circulatory system carries both the oxygen and the glucose to your cells, where respiration occurs.

## The Path of Air

If you look toward a window on a bright day, you may see tiny particles dancing in the air. These particles include such things as floating grains of dust, plant pollen, and ash from fires. Though you can't see them, air also contains microorganisms. Some of these microorganisms can cause diseases in humans. When you breathe in, all these materials enter your body along with the air.

However, most of these materials never reach your lungs. On its way to the lungs, air passes through a series of structures that filter and trap particles. These organs also warm and moisten the air. **As air travels from the outside environment to the lungs, it passes through the following structures: nose, pharynx, trachea, and bronchi.** It takes air only a few seconds to complete the route from the nose to the lungs.

**The Nose** Air enters the body through the nose and then moves into spaces called the nasal cavities. Some of the cells lining the nasal cavities produce mucus. This sticky material moistens the air and keeps the lining from drying out. Mucus also traps particles such as dust.

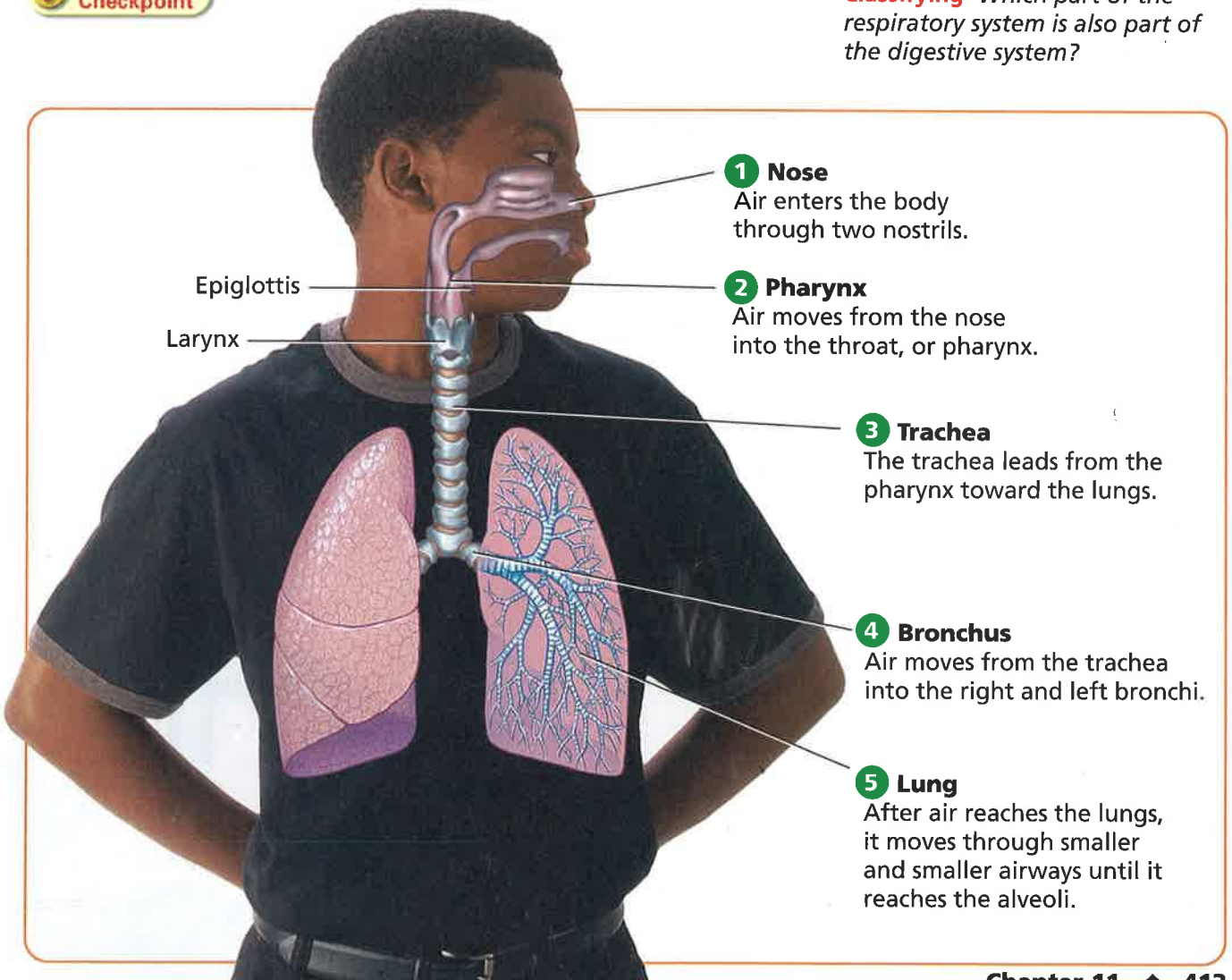
The cells that line the nasal cavities have **cilia** (SIL ee uh), tiny hairlike extensions that can move together in a sweeping motion. The cilia sweep the mucus into the throat, where you swallow it. Stomach acid destroys the mucus, along with everything trapped in it.

Some particles and bacteria can irritate the lining of your nose or throat, causing you to sneeze. The powerful force of a sneeze shoots the particles out of your nose and into the air.

**The Pharynx** Next, air enters the **pharynx** (FAR ingks), or throat. The pharynx is the only part of the respiratory system that is shared with another system—the digestive system. Both the nose and the mouth connect to the pharynx.

Reading Checkpoint **What is the role of cilia?**

**FIGURE 2**
**The Respiratory System**
On its path from outside the body into the lungs, air passes through several structures that clean, warm, and moisten it. Once in the lungs, the oxygen in the air can enter your bloodstream.
**Classifying** *Which part of the respiratory system is also part of the digestive system?*



Lab zone **Try This Activity**

## What Do You Exhale?

Learn whether carbon dioxide is present in exhaled air.

1. Label two test tubes *A* and *B*.
2. Fill each test tube with 10 mL of water and a few drops of bromthymol blue solution. Bromthymol blue solution turns green or yellow in the presence of carbon dioxide.
3. Using a straw, gently blow air into the liquid in test tube A for a few seconds. **CAUTION:** *Do not suck the solution back through the straw.*
4. Compare the solutions in the test tubes.

**Predicting** Suppose you had exercised immediately before you blew into the straw. Predict how this would have affected the results.

**The Trachea** From the pharynx, air moves into the **trachea** (TRAY kee uh), or windpipe. You can feel your trachea if you gently run your fingers down the center of your neck. The trachea feels like a tube with a series of ridges. The firm ridges are rings of cartilage that strengthen the trachea and keep it open.

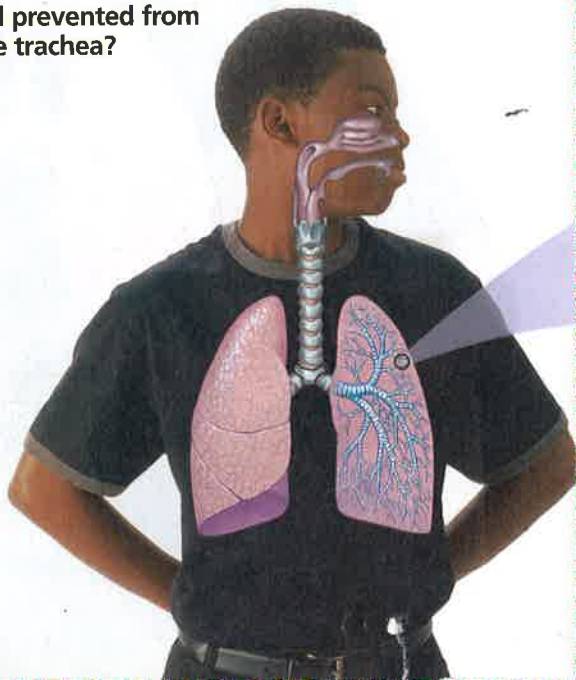
The trachea, like the nose, is lined with cilia and mucus. The cilia in the trachea sweep upward, moving mucus toward the pharynx, where it is swallowed. The trachea's cilia and mucus continue the cleaning and moistening of air that began in the nose. If particles irritate the lining of the trachea, you cough. A cough, like a sneeze, sends the particles into the air.

Normally, only air—not food—enters the trachea. If food does enter the trachea, the food can block the opening and prevent air from getting to the lungs. When that happens, a person chokes. Fortunately, food rarely gets into the trachea. The epiglottis, a small flap of tissue that folds over the trachea, seals off the trachea while you swallow.

**The Bronchi and Lungs** Air moves from the trachea to the **bronchi** (BRAHNG ky) (singular *bronchus*), the passages that direct air into the lungs. The **lungs** are the main organs of the respiratory system. The left bronchus leads into the left lung, and the right bronchus leads into the right lung. Inside the lungs, each bronchus divides into smaller and smaller tubes in a pattern that resembles the branches of a tree.

At the end of the smallest tubes are structures that look like bunches of grapes. The "grapes" are **alveoli** (al VEE uh ly) (singular *alveolus*), tiny sacs of lung tissue specialized for the movement of gases between air and blood. Notice in Figure 3 that each alveolus is surrounded by a network of capillaries. It is here that the blood picks up its cargo of oxygen from the air.

Reading Checkpoint **How is food prevented from entering the trachea?**



## Gas Exchange

Because the walls of both the alveoli and the capillaries are very thin, certain materials can pass through them easily. **After air enters an alveolus, oxygen passes through the wall of the alveolus and then through the capillary wall into the blood. Carbon dioxide and water pass from the blood into the alveoli. This whole process is known as gas exchange.**


**How Gas Exchange Occurs** Imagine that you are a drop of blood beginning your journey through a capillary that wraps around an alveolus. When you begin that journey, you are carrying a lot of carbon dioxide and little oxygen. As you move through the capillary, oxygen gradually attaches to the hemoglobin in your red blood cells. At the same time, you are getting rid of carbon dioxide. At the end of your journey around the alveolus, you are rich in oxygen and poor in carbon dioxide.

FIGURE 3

### Gas Exchange in the Alveoli

Alveoli are hollow air sacs surrounded by capillaries. As blood flows through the capillaries, oxygen moves from the alveoli into the blood. At the same time, carbon dioxide moves from the blood into the alveoli.

**Interpreting Diagrams** *How is the structure of the alveoli important for gas exchange?*

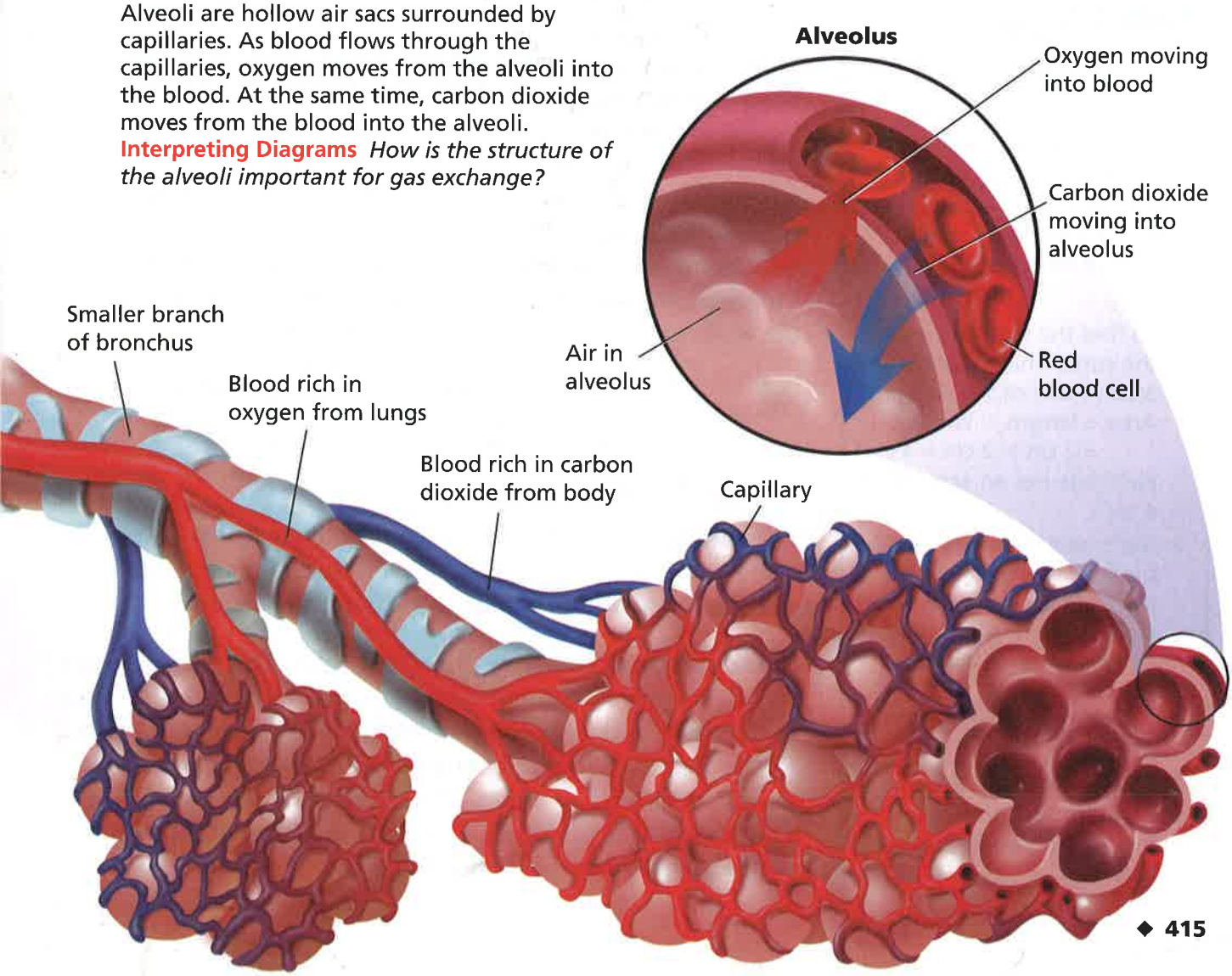


**FIGURE 4**
**Oxygen for Activities**
The huge surface area of the alveoli supplies the oxygen these trombone players need to march and play.

**Surface Area for Gas Exchange** Your lungs can absorb a large amount of oxygen because of the large surface area of the alveoli. An adult's lungs contain about 300 million alveoli. If you opened the alveoli and spread them out on a flat surface, you would have a surface area of about 70 square meters.

The huge surface area of the alveoli enables the lungs to absorb a large amount of oxygen. The lungs can, therefore, supply the oxygen that people need—even when they are performing strenuous activities. When you play a wind instrument or a fast-paced game of basketball, you have your alveoli to thank.

Your lungs are not the only organs that provide a large surface area in a relatively small space. Recall from Chapter 9 that the small intestine contains numerous, tiny villi that increase the surface available to absorb food molecules.

Reading Checkpoint **What gases are exchanged across the alveoli?**

## How You Breathe

In an average day, you may breathe more than 20,000 times. The rate at which you breathe depends on your body's need for oxygen. The more oxygen you need, the faster you breathe.

**Muscles for Breathing** Breathing, like other body movements, is controlled by muscles. Figure 5 shows the structure of the chest, including the muscles that enable you to breathe. Notice that the lungs are surrounded by the ribs, which have muscles attached to them. At the base of the lungs is the **diaphragm** (DY uh fram), a large, dome-shaped muscle that plays an important role in breathing.

**Math Skills**

### Surface Area

Surface area refers to the total area of all of the surfaces of a three-dimensional object. Consider a cube, which has six equal sides. Each side measures 2 cm by 2 cm.

1. To find the surface area of the cube, first calculate the area of one of the six sides:
   Area = length × width
   $= 2\ cm \times 2\ cm = 4\ cm^2$
   Each side has an area of $4\ cm^2$.
2. Next, add the areas of the six sides together to find the total surface area:
   $4\ cm^2 + 4\ cm^2 + 4\ cm^2 + 4\ cm^2 + 4\ cm^2 + 4\ cm^2 = 24\ cm^2$
   The surface area of the cube is $24\ cm^2$.

**Practice Problem** Calculate the surface area of a cube whose side measures 3 cm.

**The Process of Breathing** **When you breathe, the actions of your rib muscles and diaphragm expand or contract your chest. As a result, air flows in or out.**

Here's what happens when you inhale, or breathe in. The rib muscles contract, lifting the chest wall upward and outward. At the same time, the diaphragm contracts and moves downward. The combined action of these muscles makes the chest cavity larger. The same amount of air now occupies a larger space, causing the pressure of the air inside your lungs to decrease. This change means that the pressure of air inside the chest cavity is lower than the pressure of the atmosphere pushing on the body. Because of this difference in air pressure, air rushes into your chest, in the same way that air is sucked into a vacuum cleaner.

When you exhale, or breathe out, the rib muscles and diaphragm relax. This reduces the size of the chest cavity. This decrease in size squeezes air out of the lungs, the way squeezing a container of ketchup pushes ketchup out of the opening.

**Reading Checkpoint** **What muscles cause the chest to expand during breathing?**

FIGURE 5

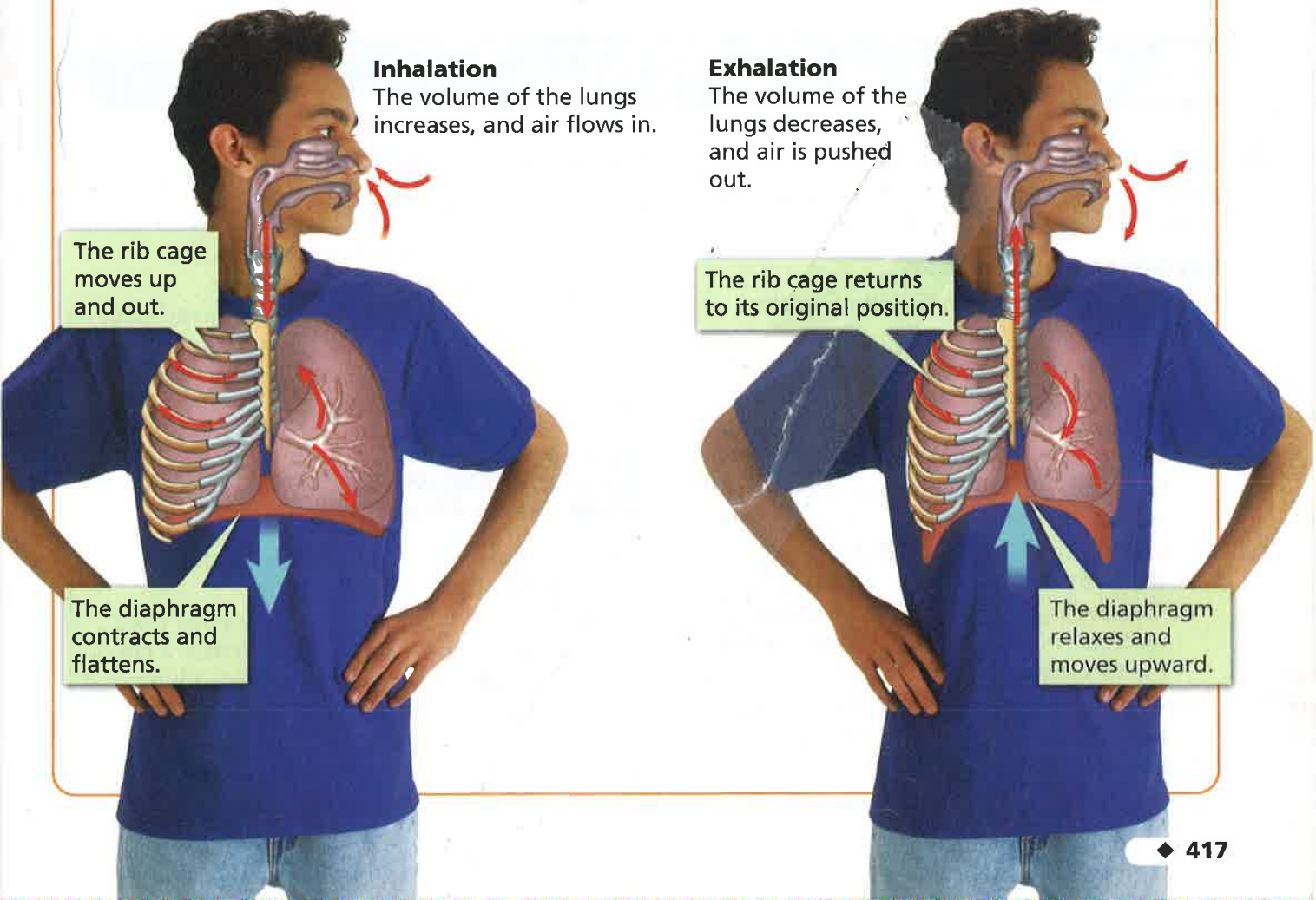
## The Breathing Process

When you inhale, the diaphragm moves downward and pressure in the lungs decreases, causing air to flow in. When you exhale, the diaphragm moves upward and the pressure in the lungs increases, pushing the air out.

**Interpreting Diagrams** *How does the movement of the diaphragm affect the size of the chest cavity?*

**Go Online active art**

**For:** The Breathing Process activity
**Visit:** PHSchool.com
**Web Code:** cep-4041



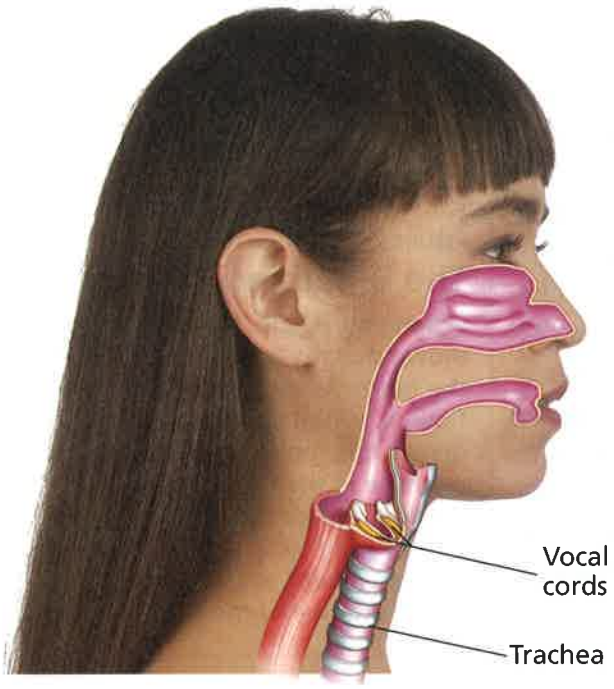



**FIGURE 6**
**The Vocal Cords**
Air moving over the vocal cords causes them to vibrate and produce sound.
**Interpreting Diagrams** *Where are the vocal cords located?*

**Relating Breathing and Speaking** The air that moves out of your lungs as you breathe also helps you speak. The **larynx** (LAR ingks), or voice box, is located in the top part of the trachea, underneath the epiglottis. Place your fingers on your Adam's apple, which sticks out from the front of your neck. You can feel some of the cartilage that makes up the larynx. Two **vocal cords,** folds of connective tissue that produce your voice, stretch across the opening of the larynx.

If you've ever let air out of a balloon while stretching its neck, you've heard the squeaking sound that the air makes. The neck of the balloon is something like your vocal cords. If you look at Figure 6 you can see that the vocal cords have a slitlike opening between them. When you speak, muscles make the vocal cords contract, narrowing the opening. Air from the lungs rushes through this opening. The movement of the vocal cords makes the air molecules vibrate, or move rapidly back and forth. This vibration creates a sound—your voice.

## Section Assessment

**Target Reading Skill** **Sequencing** With a partner, review your flowchart about the path of air. Add any necessary information.

### Reviewing Key Concepts

1. a. **Listing** What are the functions of the respiratory system?
   b. **Comparing and Contrasting** Explain the difference between respiration and breathing.
   c. **Predicting** How might respiration in your body cells be affected if your respiratory system did not work properly?
2. a. **Identifying** Name the structures of the respiratory system.
   b. **Sequencing** Describe the path that a molecule of oxygen takes as it moves from the air outside your body into the alveoli.
   c. **Relating Cause and Effect** In a healthy person, how do coughing and sneezing protect the respiratory system?
3. a. **Reviewing** What three substances are exchanged in the alveoli?
   b. **Explaining** What happens to the carbon dioxide in the blood when it flows through the capillaries in the alveoli?
   c. **Applying Concepts** How would gas exchange be affected at the top of a tall mountain, where air pressure is lower and there is less oxygen than at lower elevations? Explain.

**Math Practice**

4. **Surface Area** A cube measures 4 cm × 4 cm on a side. Find its surface area.
5. **Surface Area** Suppose you cut up the cube into eight smaller cubes, each 2 cm × 2 cm on a side. If the larger cube represents a lung, and the smaller cubes represent alveoli, which would provide a larger surface area for oxygen exchange?

Lab zone Skills Lab

# A Breath of Fresh Air

## Problem

What causes your body to inhale and exhale air?

## Skills Focus

making models, observing, drawing conclusions

## Materials

- small balloon
- large balloon
- scissors
- transparent plastic bottle with narrow neck

## Procedure

1. In your notebook, explain how you think air gets into the lungs during the breathing process.
2. Cut off and discard the bottom of a small plastic bottle. Trim the cut edge so there are no rough spots.
3. Stretch a small balloon; then blow it up a few times to stretch it further. Insert the round end of the balloon through the mouth of the bottle. Then, with a partner holding the bottle, stretch the neck of the balloon and pull it over the mouth of the bottle.
4. Stretch a large balloon; then blow it up a few times to stretch it further. Cut off and discard the balloon's neck.
5. Have a partner hold the bottle while you stretch the remaining part of the balloon over the bottom opening of the bottle, as shown in the photo.
6. Use one hand to hold the bottle firmly. With the knuckles of your other hand, push upward on the large balloon, causing it to form a dome. Remove your knuckles from the balloon, letting the balloon flatten. Repeat this procedure a few times. Observe what happens to the small balloon. Record your observations in your notebook.

## Analyze and Conclude

1. **Making Models** Make a diagram of the completed model in your notebook. Add labels to show which parts of your model represent the chest cavity, diaphragm, lungs, and trachea.
2. **Observing** In this model, what is the position of the "diaphragm" just after you have made the model "exhale"? What do the lungs look like just after you have exhaled?
3. **Drawing Conclusions** In this model, how does the "diaphragm" move? How do these movements of the "diaphragm" affect the "lungs"?
4. **Communicating** Write a paragraph describing how this model shows that pressure changes are responsible for breathing.

## More to Explore

How could you improve on this model to show more closely what happens in the chest cavity during the process of breathing? *Obtain your teacher's permission before carrying out your investigation.*

Section 2

Integrating Health

# Smoking and Your Health

## Reading Preview

### Key Concepts

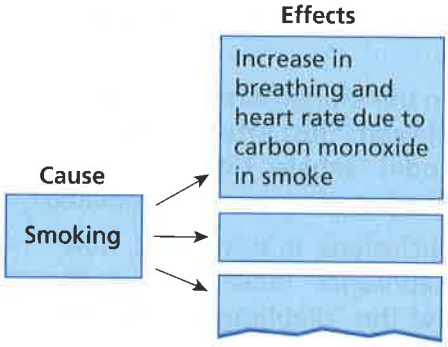
- What harmful chemicals are found in tobacco smoke?
- How can tobacco smoke affect a person's health over time?

### Key Terms

- tar
- carbon monoxide
- nicotine
- addiction
- bronchitis
- emphysema

### Target Reading Skill

**Relating Cause and Effect** As you read, identify the effects of smoking on the body. Write the information in a graphic organizer like the one below.

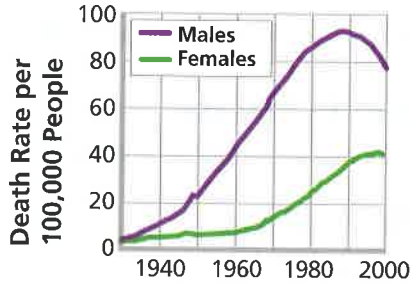



Lab zone

## Discover Activity

### What Are the Dangers of Smoking?

The graph shows the rate of lung cancer deaths in the United States from 1930 to 2000.




1. What was the rate of lung cancer deaths for males in 1930? For females?
2. What was the rate of lung cancer deaths for males in 1990? For females?
3. Did males or females show a faster rate of increase in the number of lung cancer deaths? How can you tell?
4. Cigarette smoking increased until 1965 but then decreased between 1965 and 1990. How does the trend in smoking compare with the rate of lung cancer deaths?

**Think It Over**

**Predicting** Do you think that the rate of lung cancer deaths is likely to increase, decrease, or remain the same by 2010? Explain.

Whoosh! Millions of tiny but dangerous aliens are invading the respiratory system. The aliens are pulled into the mouth with an inhaled breath. The cilia trap some aliens, and others get stuck in mucus. But thousands of the invaders get past these defenses and enter the lungs. The aliens then land on the surface of the alveoli!

The "aliens" are not tiny creatures from space. They are the substances found in cigarette smoke. In this section you will learn how tobacco smoke damages the respiratory system.

A heavy smoker may smoke two packs of cigarettes in a day.

## Chemicals in Tobacco Smoke

With each puff, a smoker inhales more than 4,000 different chemicals. **Some of the most deadly chemicals in tobacco smoke are tar, carbon monoxide, and nicotine.**

**Tar** The dark, sticky substance that forms when tobacco burns is called **tar.** When someone inhales tobacco smoke, some tar settles on cilia that line the trachea, bronchi, and smaller airways. Tar makes cilia clump together so they can't function to prevent harmful materials from getting into the lungs. Tar also contains chemicals that have been shown to cause cancer.

**Carbon Monoxide** When substances—including tobacco—are burned, a colorless, odorless gas called **carbon monoxide** is produced. Carbon monoxide is dangerous because its molecules bind to hemoglobin in red blood cells. When carbon monoxide binds to hemoglobin, it takes the place of some of the oxygen that the red blood cells normally carry. The carbon monoxide molecules are something like cars that are parked in spaces reserved for other cars.

When carbon monoxide binds to hemoglobin, red blood cells carry less than their normal load of oxygen throughout the body. To make up for the decrease in oxygen, the breathing rate increases and the heart beats faster. Smokers' blood may contain too little oxygen to meet their bodies' needs.

**Nicotine** Another dangerous chemical found in tobacco is **nicotine.** Nicotine is a stimulant drug that increases the activities of the nervous system and heart. It makes the heart beat faster and increases blood pressure. Over time, nicotine produces an **addiction,** or physical dependence. Smokers feel an intense craving for a cigarette if they go without one. Addiction to nicotine is one reason why smokers have difficulty quitting.

Reading Checkpoint **How does the tar in cigarettes affect the body?**

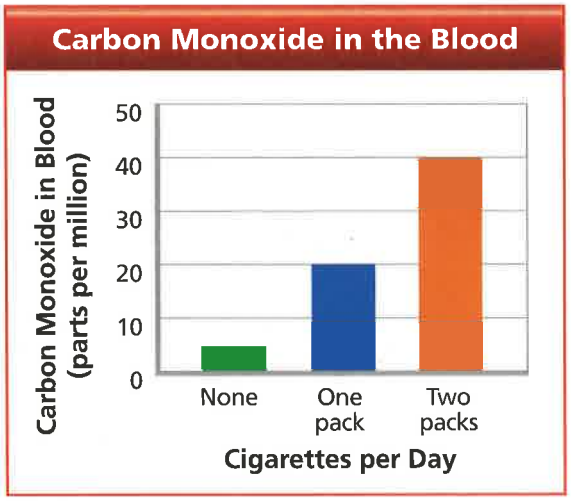
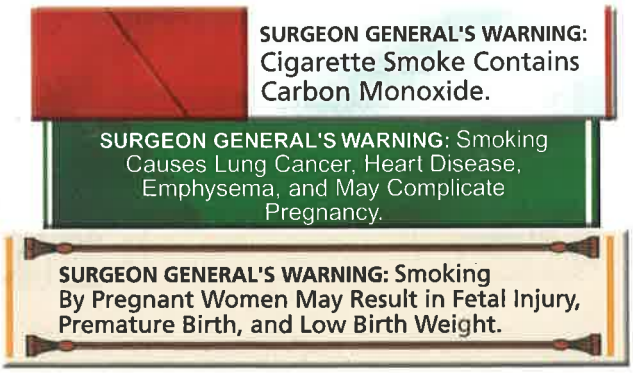



**FIGURE 7**
**Carbon Monoxide in the Blood**
The more cigarettes a person smokes, the more carbon monoxide he or she inhales.
**Relating Cause and Effect** *How does carbon monoxide deprive the body of oxygen?*



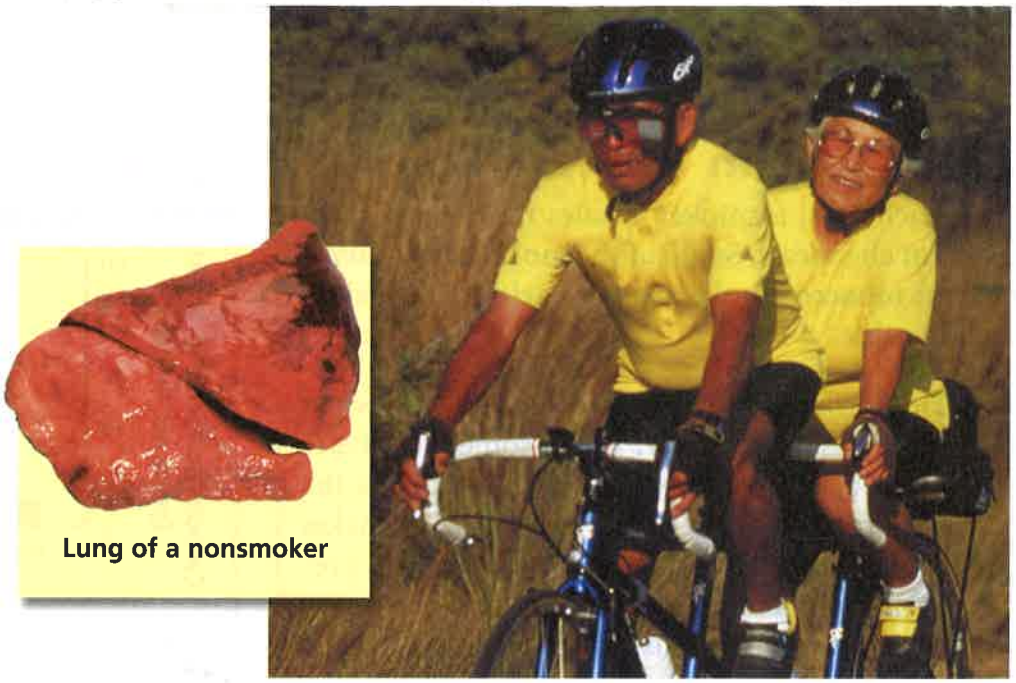



**FIGURE 8**
**Staying Healthy by Not Smoking**
People stay healthy by exercising and by choosing not to smoke.

## Health Problems and Smoking

Tobacco smoke causes health problems in several ways. For example, because the cilia can't sweep away mucus, many smokers have a frequent cough. The mucus buildup also limits the space for airflow, thus decreasing oxygen intake. Because they are not getting enough oxygen, long-term or heavy smokers may be short of breath during even light exercise.

You probably know that smoking damages the respiratory system, but did you know that it strains the circulatory system as well? The respiratory and circulatory systems work together to get oxygen to body cells. If either system is damaged, the other one must work harder. Serious health problems can result from long-term smoking. **Over time, smokers can develop chronic bronchitis, emphysema, lung cancer, and atherosclerosis.** Every year in the United States, more than 400,000 people die from smoking-related illnesses. That's one out of every five deaths. Tobacco smoke is the most important preventable cause of major illness and death.

**Chronic Bronchitis** **Bronchitis** (brahng KY tis) is an irritation of the breathing passages in which the small passages become narrower than normal and may be clogged with mucus. People with bronchitis have difficulty breathing. If the irritation continues over a long time, it is called chronic bronchitis. Chronic bronchitis can cause permanent damage to the breathing passages. It is often accompanied by infection with disease-causing microorganisms. Chronic bronchitis is five to ten times more common in heavy smokers than in nonsmokers.

**Lab zone Skills Activity**

### Calculating

Heavy smokers may smoke two packs of cigarettes every day. Find out what one pack of cigarettes costs. Then, use that price to calculate how much a person would spend on cigarettes if he or she smoked two packs a day for 30 years.

**FIGURE 9**
**Effects of Smoking on the Lungs**
Over time, smoking damages the lungs and leads to serious health problems. **Comparing and Contrasting** *Compare the lungs of a person with emphysema and a person with lung cancer to the lung of a nonsmoker shown in Figure 8.*

Lung with emphysema

Lung with cancer

**Emphysema** The chemicals in tobacco smoke damage lung tissue as well as breathing passages. **Emphysema** (em fuh SEE muh) is a serious disease that destroys lung tissue and causes breathing difficulties. People with emphysema do not get enough oxygen and cannot adequately eliminate carbon dioxide. Therefore, they are always short of breath. Some people with emphysema even have trouble blowing out a match. Unfortunately, the damage caused by emphysema is permanent, even if a person stops smoking.

**Lung Cancer** About 140,000 Americans die each year from lung cancer caused by smoking. Cigarette smoke contains more than 50 different chemicals that cause cancer, including the chemicals in tar. Cancerous growths, or tumors, take away space in the lungs that are used for gas exchange. Unfortunately, lung cancer is rarely detected early, when treatment would be most effective.

**Atherosclerosis** The chemicals in tobacco smoke also harm the circulatory system. Some of the chemicals get into the blood and are absorbed by the blood vessels. The chemicals then irritate the walls of the blood vessels. This irritation contributes to the buildup of fatty material on the blood vessel walls that causes atherosclerosis. Atherosclerosis can lead to heart attacks. Compared to nonsmokers, smokers are more than twice as likely to have heart attacks.

Reading Checkpoint **How does emphysema affect a person's lungs?**


**FIGURE 10**
**Passive Smoking**
Billboards like this one increase people's awareness that nonsmokers can also suffer from the effects of tobacco smoke.

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**Visit:** www.SciLinks.org
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**Passive Smoking** Smokers are not the only people to suffer from the effects of tobacco smoke. In passive smoking, people involuntarily inhale the smoke from other people's cigarettes, cigars, or pipes. This smoke contains the same harmful chemicals that smokers inhale. Each year, passive smoking is associated with the development of bronchitis and other respiratory problems, such as asthma, in about 300,000 young children in the United States.

## Section 2 Assessment

**Target Reading Skill** **Relating Cause and Effect** Refer to your graphic organizer about the effects of smoking on the body to help you answer the questions below.

### Reviewing Key Concepts

1. a. **Listing** What are three harmful substances in tobacco smoke?
   b. **Relating Cause and Effect** How does each of the harmful substances directly affect the body?
   c. **Developing Hypotheses** Why might nicotine-containing products, such as chewing gums or skin patches, help a person who is trying to quit smoking?
2. a. **Reviewing** Identify four health problems that can develop in smokers over time.
   b. **Describing** How does smoking contribute to atherosclerosis?
   c. **Inferring** What effect would it have on the circulatory system if a person quit smoking?

### Lab zone At-Home Activity

**Warning Labels** With a family member, make a list of the warning statements found on cigarette labels. What chemicals found in tobacco smoke and health problems do the labels identify? Summarize the information you find to share with the class.