

Lung Function

OBJECTIVES

In this activity, students discover what happens when they inhale and exhale. They also build a model of the lungs, diaphragm, and trachea.

The students

- ▶ build a lung/diaphragm model
- ▶ observe how the lungs work

SCHEDULE

About 40 minutes

VOCABULARY

diaphragm
lungs
respiratory system
trachea

MATERIALS

For each student

- 1 Activity Sheet 6

For each team of four

- 1 balloon, large
- 1 balloon, small
- 1 tube, clear plastic
- 1 vial cap, with hole

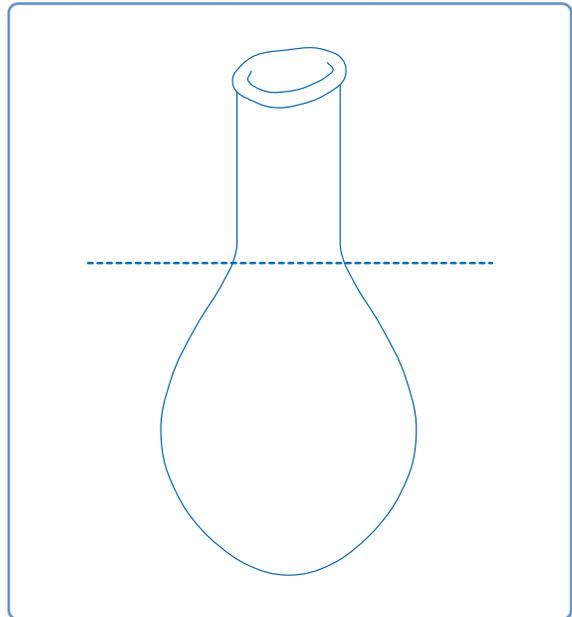
For the class

- 1 pair scissors*
- 1 transparency, lungs
- 1 piece tubing

*provided by the teacher

PREPARATION

- 1 Make a copy of Activity Sheet 6 for each student.
- 2 From the piece of thin tubing cut one 5-cm length for each team of four.
- 3 Use a pair of scissors to cut off the closed end of the clear plastic tube.
- 4 Cut the large balloon as shown in Figure 6-1. The balloon is cut so that it will fit over one end of the clear plastic tube.



▲ Figure 6-1. Where to cut the new balloon.

- 5 Each team of four students will need a 5-cm length of thin tubing, a small balloon, a vial cap with a hole in it, a large balloon that has been cut, and a clear plastic tube.

BACKGROUND INFORMATION

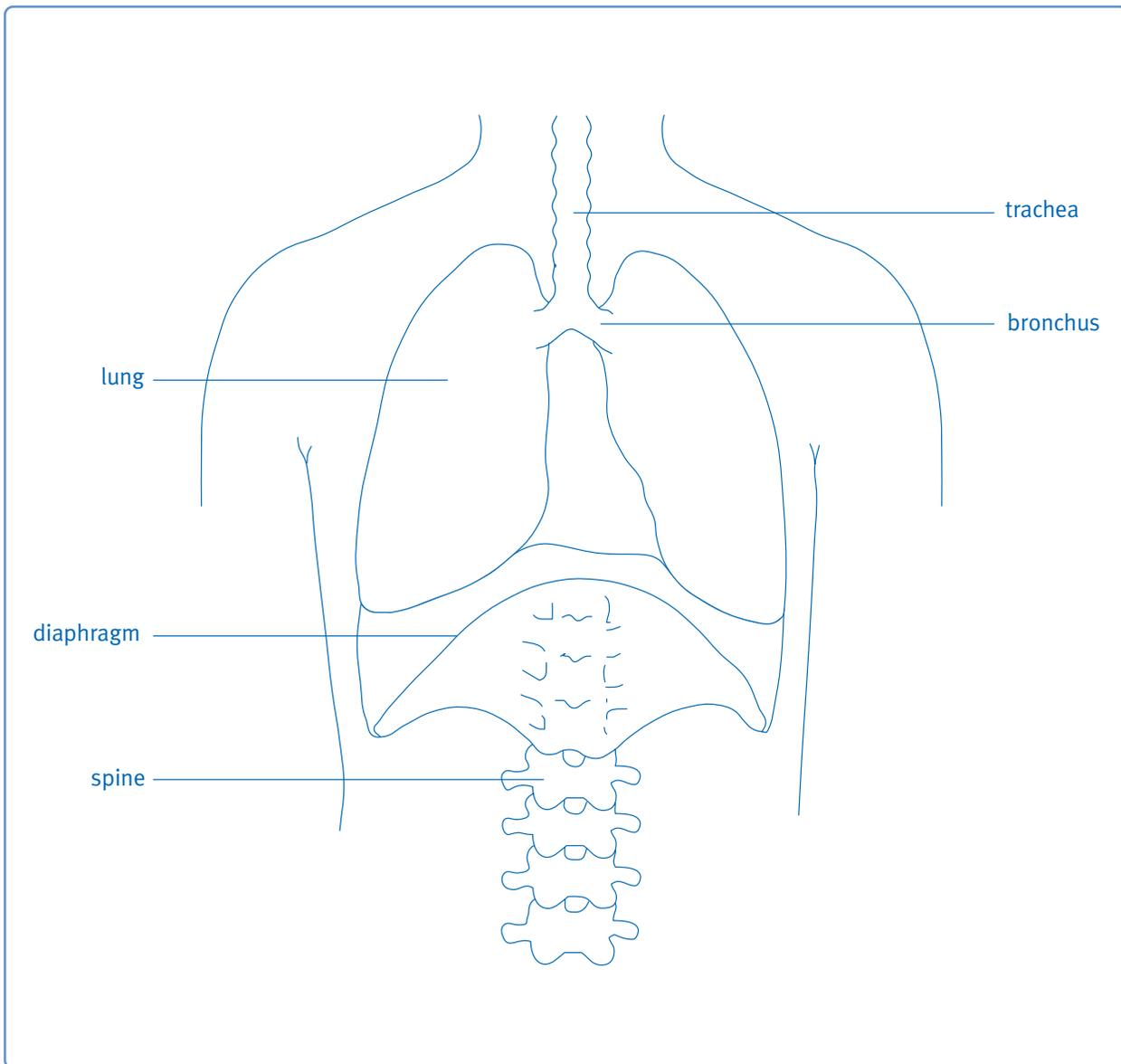
Each of us has a pair of **lungs** in our chest. The lungs are located in a cavity that is nearly a

vacuum. When the **diaphragm** (the large muscle that divides the chest cavity from the abdomen) pulls down and the chest wall expands, the cavity in which the lungs are located also expands, pulling air into the nose and mouth to the **trachea** (windpipe).

The trachea divides into two **bronchi**, each of which enters a lung. Each bronchus subdivides into smaller tubes. The smallest tubes end in clusters of air sacs called **alveoli**. Each alveolus is surrounded by capillaries; this is where the oxygen and carbon dioxide are exchanged. Oxygen from

the inhaled air is passed from the alveoli to the capillaries for use in cells throughout the body, while carbon dioxide from the “used blood” is passed back to the alveoli. Then the diaphragm relaxes, causing the chest cavity to contract and expel the carbon dioxide with the exhaled air (see Figure 6-2).

In this activity, students will construct a model simulating the chest cavity, trachea, lungs, and diaphragm, and they will view and label an illustration of the trachea and lungs.

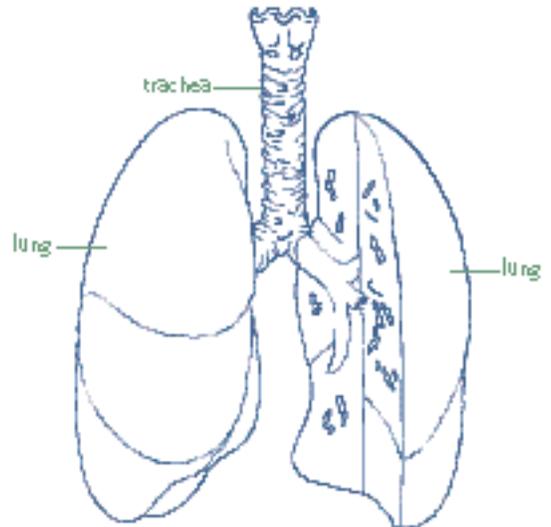


▲ Figure 6-2. The chest cavity.

▼ Activity Sheet 6

Lung Function

1. Label the trachea and the lungs.



2. On the back of this paper, draw your lung/diaphragm model. Label the diaphragm, trachea, and lungs.

Drawings should be similar to Figure 6-3.

Guiding the Activity

1 Ask, **What do you think happens when you inhale and exhale?**

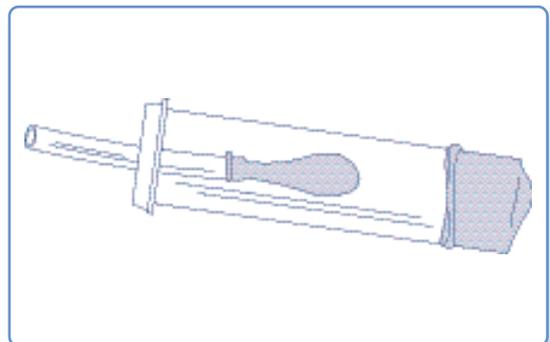
Many students may not be aware of the function of the diaphragm and what really happens when we inhale and exhale. Tell them that they will construct a model of the lungs and diaphragm to simulate what happens every time they breathe.

2 Distribute the materials and instruct the teams, step by step, on how to assemble their models.

Tell the students to attach the small balloon to one end of the 5-cm length of tubing and to push the other end of the tubing through the hole in the underside of the vial cap. Tell them to place the vial cap on the clear plastic tube so that the small balloon and tubing fit inside the larger plastic tube. Have them place the large balloon over the other end of the clear plastic tube (see Figure 6-3).

Additional Information

Most students will answer that their chest fills with air when they inhale and empties out when they exhale.



▲ *Figure 6-3. An assembled lung/diaphragm model.*

Guiding the Activity

Additional Information

3 After each team has assembled its model, tell the students to take turns pulling down on the large balloon and to observe what happens to the small balloon inside the plastic tube.

When the large balloon is pulled down, the small balloon inflates because air is being pulled into it through the small tube.

4 Write the words *lungs*, *diaphragm*, and *trachea* on the board. Explain that the **diaphragm** is a muscle that divides the chest cavity from the abdominal cavity. Display the transparency of the lungs and point out the lungs and diaphragm.

Explain that when we inhale, the diaphragm pulls downward and the chest cavity expands, pulling oxygen-rich air in through our nose and/or mouth, down through the **trachea** (a tube connecting the mouth/nose with the lungs), and into the **lungs**, where the oxygen and carbon dioxide exchange takes place.

When we exhale, the diaphragm relaxes, the chest cavity collapses, and the carbon dioxide-rich air is pushed from the lungs, through the trachea, and out through the nose and/or mouth.

Write the words *respiratory system* on the board. Tell students that the **respiratory system** includes the lungs, trachea, bronchi, and the channels leading outside of the body to the mouth and nose. The respiratory system handles the body's air supply.

5 Ask, **Which parts of your model represent the diaphragm, the trachea, and the lungs?**

Students should respond that the diaphragm is represented by the large balloon, the trachea is represented by the 5-cm length of tubing, and the lungs are represented by the small balloon.

6 Distribute **Activity Sheet 6** and tell students to label the trachea and the lungs.

Have students complete their activity sheets.

REINFORCEMENT

Have students manipulate their lung models, matching the rhythm of their own breathing with the simulated breathing of the models.

SCIENCE JOURNALS

Have students place their completed activity sheets in their science journals.

CLEANUP

Students should disassemble their lung/diaphragm models and return the materials to the kit.

Connections

Science Challenge

Ask students to identify another function besides breathing that is performed by the respiratory system. Guide students to understand that making sounds—and then shaping those sounds with the tongue, teeth, and lips to form speech—is possible only when exhaled air passes upward through the voicebox, or larynx, in the throat. Have students place their fingers against their throats as they speak. They will feel the vibrations as air passes over their vocal cords. Let students investigate how this process occurs and how speech is created.

Science Extension

Students may wonder what causes hiccups. Encourage students to research the cause (spasmodic contractions of the diaphragm) and to try to duplicate the effect with the lung/diaphragm model. Ask students whether they or their family members know any home remedies for stopping hiccups.

Science and Health

- ▶ Have students investigate the various causes of air pollution and its effects on people’s respiratory systems. Make sure students include tobacco smoke among the air pollutants they examine—both the smoke that is directly inhaled by the smoker and the smoke that is inhaled by nonsmokers nearby. Encourage students to pay particular attention to specific pollution problems in their community or area.
- ▶ Have students investigate respiratory hazards commonly found in homes or schools, such as the following: hazards caused by faulty heating systems, air conditioners, and humidifiers; airborne particles (dust, pollen, mold spores, and so

forth) that can cause allergic reactions; and fumes from cleaning products, paints, solvents, and other chemicals used in poorly ventilated spaces.

- ▶ With people becoming more aware of and concerned about pollutants in the air they breathe, commercially available air cleaners have become more popular. Have students investigate the types of cleaners sold for home use. Tell them to find out how the cleaners work and whether they are truly effective in removing pollutants from the air.

Science and Language Arts

Although many types of animals besides humans breathe with lungs, many others have different methods of respiration, such as gills (fish and young amphibians) or spiracles (insects and spiders). Students can research several other methods of respiration and share their findings in an oral or written report.

Science, Technology, and Society

- ▶ Students could investigate various electronic voice aids available for people who have had their larynx surgically removed because of disease.
- ▶ Students could research respirators used by people who are unable to breathe normally on their own. Encourage students to research the two basic types of respirators: the positive-pressure type, which forces or assists the flow of air into the patient’s lungs, and the negative-pressure type (the so-called “iron lung”), which creates a vacuum that causes the patient’s chest to expand, thus inhaling air. Prompt students to try to find pictures of the two types of respirators for comparison.