

# Science Experiment

## Just Breathe: Creating Model Working Lungs

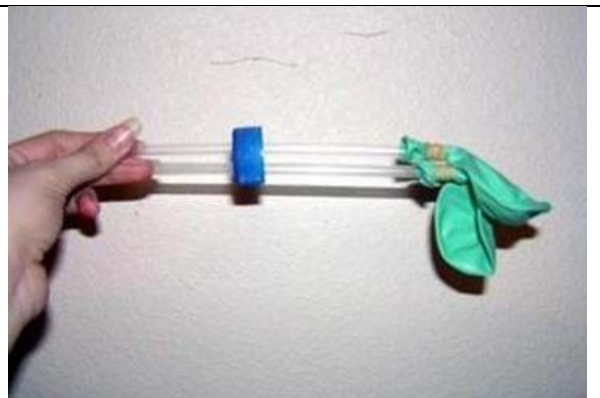
Engineers use models to study complicated processes and better understand them. In this activity, you will act like engineers by building models of the lungs in order to study the breathing process and what happens when you breathe in and out.

### Materials:

- 2 litre empty plastic bottle with cap
- 2 plastic drinking straws; available inexpensively at restaurant supply stores or donated by fast-food chains; do not use the flexible drinking straws
- 2 nine inch balloons
- 1 larger balloon; for example, for a punch ball
- 2 rubber bands

### Experiment:

1. In each of the 2 litre empty plastic bottle cap, make 2 holes that are just big enough for a drinking straw to fit through.  
Tip: Make sure to drill the holes far enough apart that the holes do not become one big hole! (You may need an adult to help you with this part)
2. Cut off the bottom of the 2 litre empty plastic bottle.
3. The 2 litre bottle represents the human chest cavity.
4. Stick two drinking straws through the two holes in the bottle cap.
5. Place one 9-inch balloon on the end of each straw and secure them with rubber bands.
6. The straws represent the bronchi and the balloons represent the lungs.
7. Stick the balloon ends of the straws through the bottle opening and tightly screw on the lid.
8. Stretch out the larger balloon and place it over the open bottom of the bottle.
9. This larger balloon represents the diaphragm. Now they have a finished model of the lungs!
10. Now, it is time to make the lungs work!
11. Pull the diaphragm (balloon) down (that is, away from the lungs) in order to inflate the lungs.  
(Note: This makes the chest cavity larger and decreases the pressure.)
12. Push the diaphragm (balloon) in (towards the lungs) in order to deflate the lungs.  
(Note: This makes the chest cavity smaller and increases the pressure.)



## **Explanation:**

When you inhale, your diaphragm muscle contracts downward and rib muscles pull upward causing air to fill the lungs.

*Can you think of why?* Well, when your diaphragm moves down and ribs move up, they make more space in your chest (in the thoracic cavity) for air. This also decreases the pressure on your lungs so the air will flow in from the outside. The opposite happens when you breathe out. Your diaphragm relaxes and the ribs and lungs push in which causes air to be pushed out.

Engineers need to understand the respiratory process in order to design machines and medicines to help people whose respiratory systems function incorrectly or with difficulty.

*Have you ever known someone who suffers from asthma or pneumonia?* Well, chemical engineers design devices and medicines, such as inhalers filled with an adrenergic bronchodilator to help people breathe better. Engineers have also developed artificial lungs that help people breathe while fighting off infections. And engineers also design the systems that help astronauts breathe easily during space flight, when they are far away from the Earth's atmosphere.