

Making a Model of the Lungs **Teacher Notes**

The instructions in this pack can be used as a guide for students to make their own model of the human breathing system. You could also use the instructions to make a model that can be used to demonstrate the mechanism of breathing to your class. This can be a useful alternative to the traditional bell jar model of the lungs if you do not have one of these available.

Equipment

a clean, clear plastic bottle (at least 500ml)
 scissors
 narrow, bendy plastic drinking straws × 2
 wide plastic drinking straw
 sticky tape
 small balloons × 2
 large balloon
 modelling clay

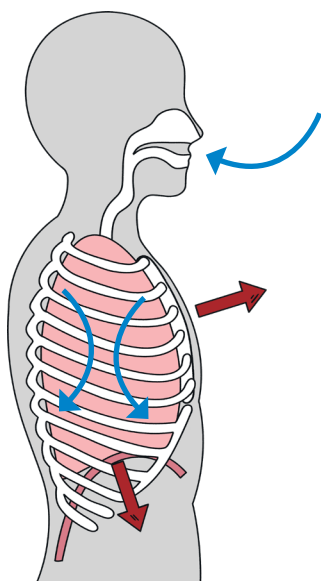
If you do not have access to some of the equipment listed, there are some alternative options available for making the model:

- Clear plastic drinking cups turned upside down can be used instead of plastic bottles. These have the advantage of already having an opening at one end, but a hole will need to be cut in the other end in order for the drinking straw to be pushed through.
- Taping the pieces of plastic straw together can be fiddly and it may be difficult to ensure that it is airtight. Another option would be to use a hot glue gun to stick the pieces of straw together – this is more feasible if you are making a single model yourself or have a small group. Alternatively, two bendy plastic straws can be used side by side and taped together. This removes the need for cutting and arranging the straws, but has the drawback of the trachea being represented as two separate tubes rather than a single tube. This may be something for students to consider in their evaluation of the model.
- A square piece of thin plastic, such as from a plastic shopping bag or bin liner, can be used to represent the diaphragm as an alternative to the large balloon, which may be difficult to attach to the plastic bottle depending on its size and shape. The piece of plastic can be taped around the edge of the bottle or attached using an elastic band, ensuring that there are no gaps. A tab of sticky tape can be attached to the middle of the piece of plastic to allow the diaphragm to be pulled down.

The differentiated **Modelling the Mechanism of Breathing Worksheets** provide space for students to explain and evaluate their models. Students should find that when the knot of the balloon representing the diaphragm is pulled down, the smaller balloons inside the bottle inflate. When the knot is pushed up into the bottle, the smaller balloons should deflate. This happens due to pressure differences between the atmosphere and the air inside the bottle.

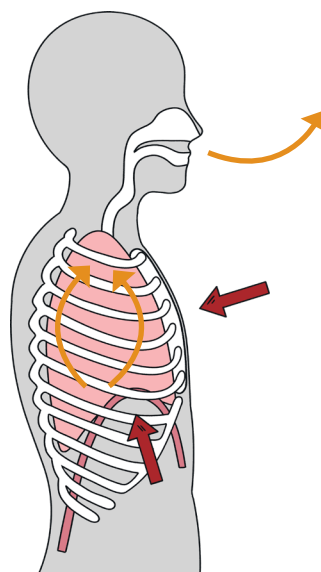
Inhalation (or inspiration) is the process of breathing in. This happens as a result of the diaphragm contracting and flattening, while the contraction of the intercostal muscles causes the ribs to move up and out. This increases the volume of the chest, which decreases the pressure. This causes air to rush in from outside the body and fill the lungs. In the model, pulling the balloon diaphragm down increases the volume of the plastic bottle, therefore decreasing the pressure. Because the pressure inside the plastic bottle is lower than the pressure outside, air from the outside of the bottle is drawn through the straws into the balloons, causing them to inflate.

Exhalation (or expiration) is the process of breathing out. This is caused by the relaxation of the diaphragm and intercostal muscles. This makes the volume of the chest smaller, which increases the pressure, pushing the air out of the lungs. Pushing up on the balloon diaphragm in the model decreases the volume of the plastic bottle, therefore increasing pressure. The change in pressure forces the air out of the balloons, causing them to deflate.



Inhalation

(diaphragm flattens, ribcage moves up and out)



Exhalation

(diaphragm relaxes, ribcage moves down)

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