Lungs in a Bottle

You will need

- Scissors
- Sticky tape
- Strip of card
- Balloon
- Piece of paper for the diaphragm. Although it works with paper a more flexible material works better. Try using a large balloon with the top cut off and a knot tied in the neck, this would be good to use with a smaller bottle as it is more difficult to stretch a balloon over a larger bottle (experiment for yourself).
- A small plate to draw round
- An empty 2 litre drinks bottle or a smaller bottle (just scale everything down but make sure the balloon fits in the bottle).

Health and Safety

- Get an adult to help you with this experiment.
- Be careful with scissors especially when you are cutting the top off the drinks bottle. Ask an adult to make a slit in the bottle first using a knife, this makes it easier to start cutting.
- Make sure you don't have any sharp edges on your bottle.

Instructions

1. Cut the top off the drinks bottle (pictures 1 and 2). Make sure you leave enough room for a balloon to hang down with space underneath it (look at picture 4 before you start cutting).
2. Push a balloon through the neck of the bottle (picture 3).
3. Stretch the balloon over the neck of the bottle (picture 4).
4. Draw round a small plate to make a circle. The plate must be bigger than the diameter of the drinks bottle (picture 5). Or use a large balloon at this stage and skip instruction 5.
5. Put the cut bottle roughly in the middle of your circle of paper and draw around it. Cut a kind of fringe around the edge of the circle almost to the smaller circle you drew and fold up the 'fringe' to make it fit around the bottle better and make it easier to stick the paper to the bottle (picture 6).
6. Tape the circle of paper over the cut end of the bottle. Tape it securely making sure there are no gaps or holes in the paper (picture 7). If using a balloon, cut the bottom off the balloon, tie a knot in the neck and stretch the cut end over the bottom of the bottle. The neck of the balloon will replace the strip of card and you don't have to do anymore; your lungs are complete.
7. Fold your strip of card in half and fold over both edges to make tabs (picture 8).
8. Tape the folded strip of card to your lung (picture 9). Your lungs are complete (picture 10)!
9. Pull the strip of card down and then push it back up. Don't be too vigorous here or you will break the card or the plastic. What happens to the balloon?

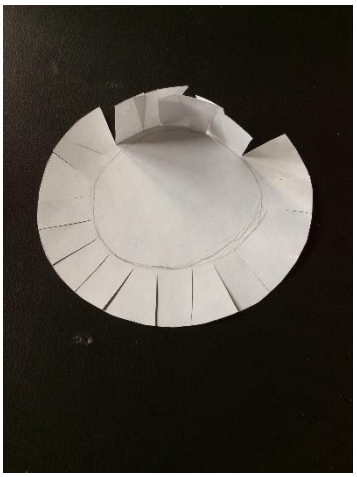
Picture 1

Picture 2

Picture 3

Picture 4

Picture 5



Picture 6

Picture 7

Picture 8

Picture 9

Picture 10

What's happening?

First of all let us look at what we have made and compare it to our own lungs (or lung to be more precise).

- The bottle represents the chest (thoracic cavity).
- The balloon represents one of your lungs.
- The neck of the bottle represents your wind pipe (trachea).
- The paper or balloon represents your diaphragm.
- The strip of card or neck of the balloon allows you to move the diaphragm up and down.

And the Science?

Breathing is also called respiration. Your diaphragm is an organ underneath your ribs. It is a muscle and it separates your lungs and your heart from the lower organs. This means you have a cavity in your upper body (the thoracic cavity) which is important for breathing.

When the diaphragm contracts, your thoracic cavity ends up with more space inside it (it expands). This means that air is pulled into the thoracic cavity to fill up this space. This air enters the thoracic cavity through your nose and mouth, goes down through your wind pipe and into your lungs which expand and fill up the space. This air has a fresh supply of oxygen.

When you breathe out your diaphragm pushes up and the thoracic cavity becomes smaller. This expels air out from your lungs through your nose and mouth. This air has carbon dioxide in it which is poisonous if we have too much of it in our bodies so we need to get rid of it.