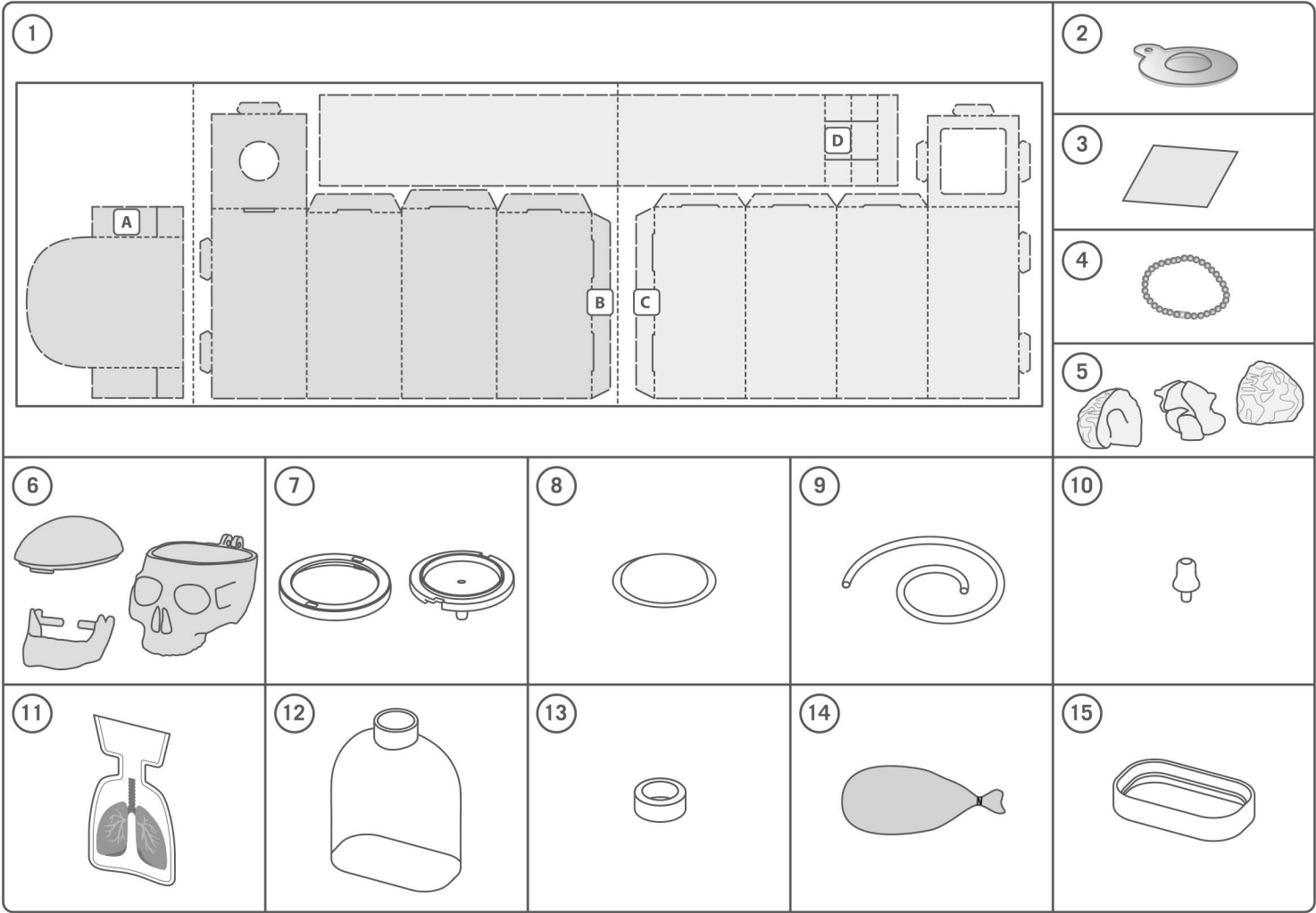


Human Organs

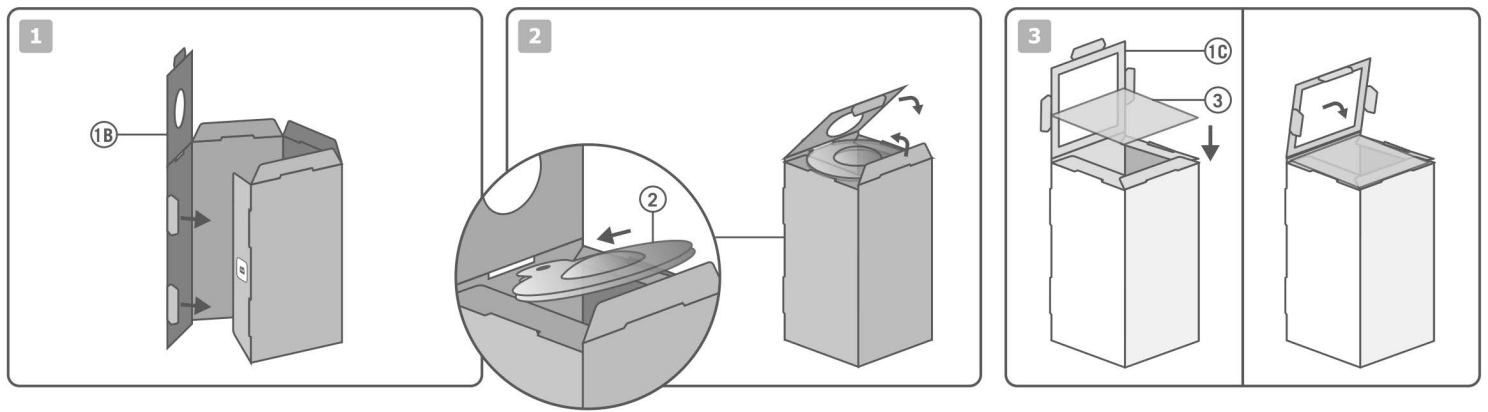
A. SAFETY MESSAGES:

- 1. Please read through these instructions before you start.
- 2. Intended for children aged 8 and over.
- 3. Adult assistance and supervision required.
- 4. This kit and its finished product contain small parts which may cause choking if misused. Keep away from children under 3 years old.



B. CONTENTS:

Part 1A: Cardboard lungs, Part 1B: Outer projector box, Part 1C: Inner projector box, Part 1D: Reaction challenge strip. Part 2: Plastic lens. Part 3: Semi-transparent film. Part 4: Chain. Part 5: Glow brain parts. Part 6: Plastic skull set. Part 7: Diaphragm and blue disc. Part 8: Clear plastic dome. Part 9: Flexible tubing. Part 10: Earpiece. Part 11: Lung bag. Part 12: Plastic lung cavity. Part 13: Blue lid. Part 14: Balloon. Part 15: Blue base. Also required but not included: a pencil, an AA battery and a pair of scissors.



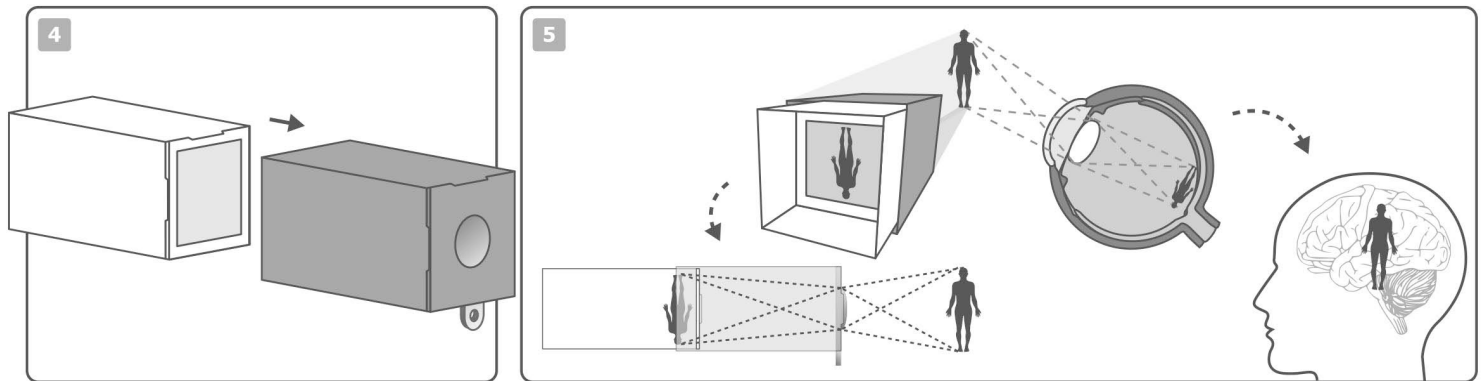
C. ACTIVITY 1 – PINHOLE PROJECTOR (EYE MODEL):

The eye is a marvellous machine that helps us see the world around us. But do you know how it actually works? Find out with this eye-popping activity.

From kit: outer and inner projector boxes (Templates 1B & 1C), plastic lens, semi-transparent film

ASSEMBLY AND OPERATION:

1. Fold the outer projector box (Template 1B) along the scored lines to make a rectangular tube.
2. Fit the lens onto the tube, making sure that the raised part of the lens is facing upwards. Fold the top cover to secure it in place.
3. Fold the inner projector box similarly (Template 1C). This time, fit the semi-transparent film to the end and also secure it with the top cover.



4. Slide the inner box into the outer box.

5. Point the pinhole projector with the lens end to any object. A projected image will be shown on the semi-transparent film. Pull the two boxes apart to focus on objects that are farther away. Push the two boxes together to focus on closer objects.

HOW DOES IT WORK?

The diagram printed on Panel 1 of the projector demonstrates how this projected image is formed. The plastic lens resembles the lens of the eye, and the semi-transparent film resembles the retina. Light rays pass through the lens of your eye and are 'recorded' at the back of your eye (the retina). The retina then sends the 'picture' to your brain. Humans actually see things upside down. It's our brain that turns them the right way up. For the pinhole projector, you have to slide the boxes to adjust the focal length. But in your eyes, the lens can change shape to focus on objects from different distances.

OPTICAL TRICKS

When you see things, your brain tries to interpret and make sense of them, creating a perception of reality. Optical illusions can mislead your brain by using colours, contrast, and patterns. Now try some of these tricks to test your eyesight. They are printed on the side panels.

PANEL 2: Rotating Snakes -

Take a close look and keep looking at it. You should see several discs start to rotate spontaneously - wow!

PANEL 3: Floating Ball -

Move the card back and forth. The centre circular object may appear to be floating because of the intersection of the vertical and horizontal bars, which brings an illusion to your brain.

PANEL 4: Black or White -

At a glimpse, you may see several black dots. But when you look directly at each dot, you will see that all dots are white!

PANEL 5: Shade Illusion -

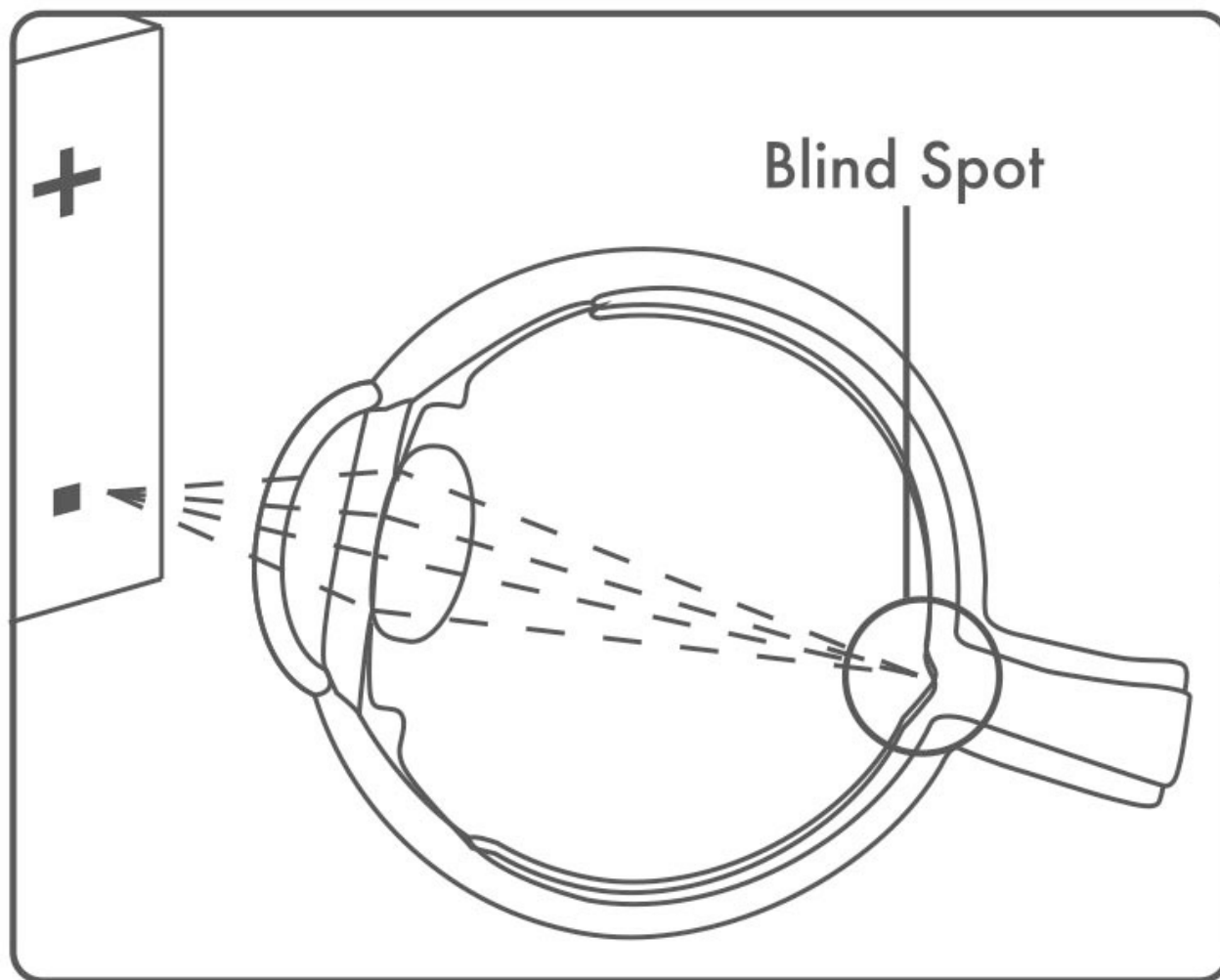
See two shades of blue? Actually they are the same! Your perception is affected by the neighbouring black and white strips.

PANEL 6: Length Illusion -

The two horizontal lines may seem to be different in length. But if you measure them with a ruler, they are the same. The arrow heads trick your brain to misjudge their length.

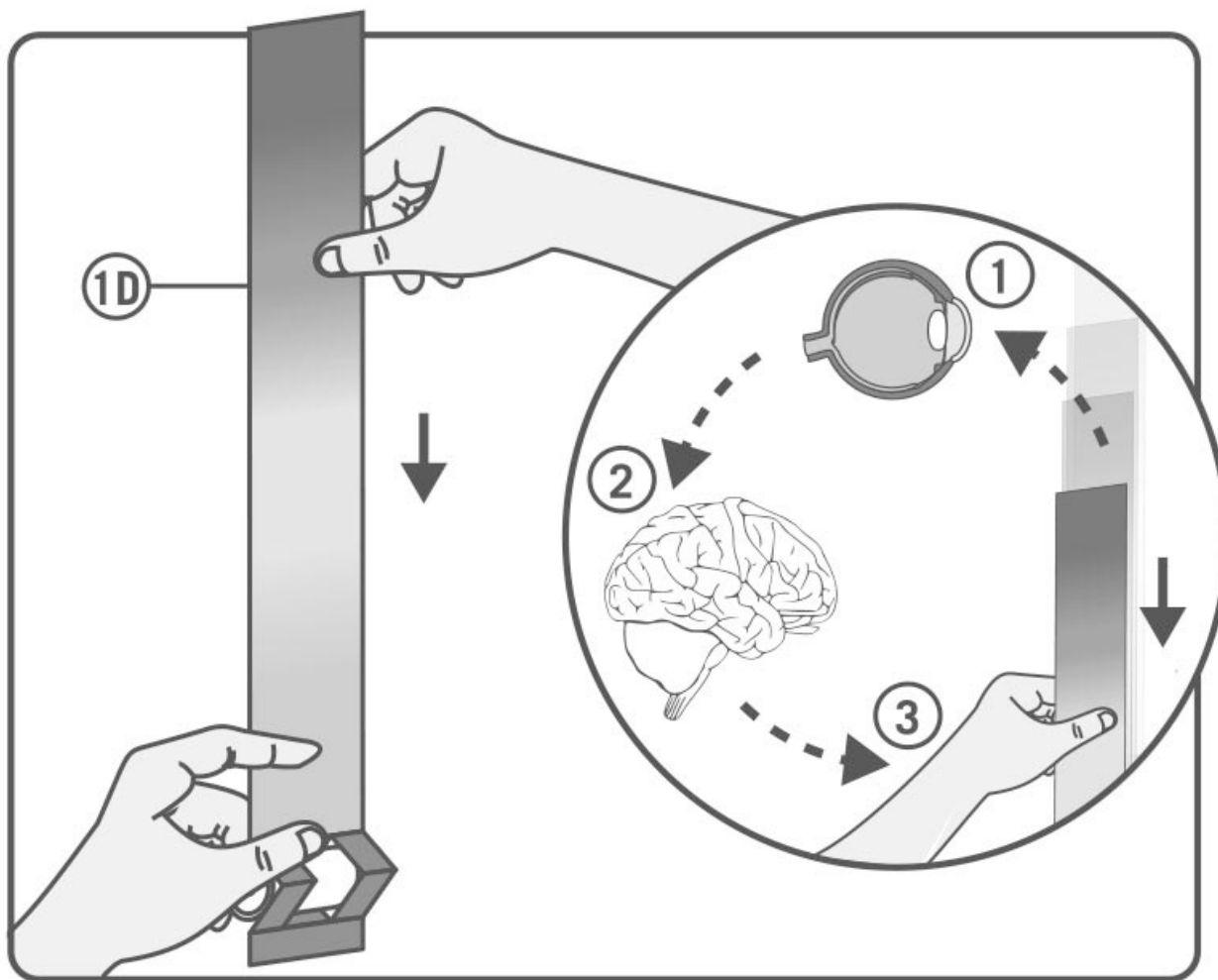
PANEL 7: Size Illusion -

Which inner circle looks bigger? The yellow circle? In fact, they are the same size!



PANEL 8: Blind Spot -

This trick has to do with your eye structure. Hold the panel at arm's length and make sure the 'cross' is on the left. Cover your left eye and look directly at the 'cross' with your right eye. Slowly bring it towards your face – the 'dot' will disappear. Move it away again and the 'dot' will reappear. Your retina has a blind spot, an area that doesn't have any light receptors. Any image that falls on this region will not be seen (as illustrated on the right).



REACTION CHALLENGE:

This activity demonstrates brain-eye coordination. Take the reaction challenge strip (Template 1D) and a used AA battery as a weight. Insert the battery into the grey part of the strip. Ask a friend to hold the paper strip's top. Position your thumb and index finger at the strip's bottom – but not touching the paper. Ask your friend to let go of the strip without telling you, leaving you to catch it. The coloured areas on the strip indicate your reaction time. How fast did you react? Try it with a group of friends!

When you see your friend letting go of the paper (1), the visual image is received (like in the Eye Model), and transformed to a message that is sent to your brain (2). Your brain makes the decision that you have to catch the paper right away. It then sends motor control signals, via the spinal cord, to your hand to grab the paper (3). It looks complicated, but all the above signal sending and receiving happens in just a fraction of time!

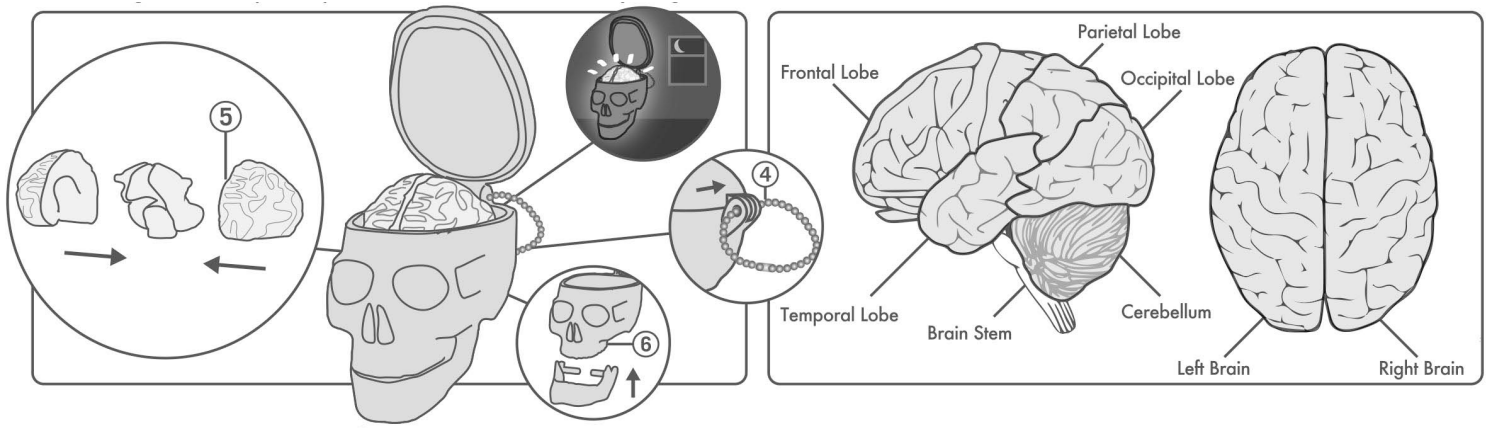
FUN FACTS:

- On average, we blink over 28,000 times a day. Plus, you blink more when you talk!
- The human eye can distinguish around 10 million different colours.
- Eyes are the second most complex organs after the brain.
- The largest eyeball on the planet is 18 inches wide (the size of a large watermelon) and belongs to the giant squid.
- All humans originally had brown eyes; blue eyes appeared as a mutation around 6,000 years ago.
- 285 million people all over the world are thought to be visually impaired: 82% of people living with blindness are aged 50 or over.
- 0.101 seconds is the current fastest reaction time recorded in a human being.
- A chameleon's tongue accelerates from 0-20 feet in about 20 milliseconds – now that's fast!
- You always close your eyes when you sneeze – an involuntary reflex causes this reaction.

D. ACTIVITY 2 - SKULL & BRAIN MODEL:

Do you know that your brain contains around 100 billion nerve cells? In this activity you'll find out the general structure of your brilliant brain. You can also use the model as a keyring and watch the squishy brain inside glow in the dark.

From kit: glow brain parts, plastic skull set, chain for key ring



ASSEMBLY AND OPERATION:

Hold the smallest part of the brain so that the brain stem is facing you. Take the left and right parts of the brain and, making sure they are both facing in the right direction, and place them on the correct sides of the brain stem. Take your finished brain and put it into the skull cavity. The brain stem should fit snugly into the hole in the cavity. Fit the jaw to the skull and then attach the skull cover. Finally, thread the chain through the hole at the back of the skull. Charge the skull keychain under any light source and then bring it into the dark. The brain will glow!

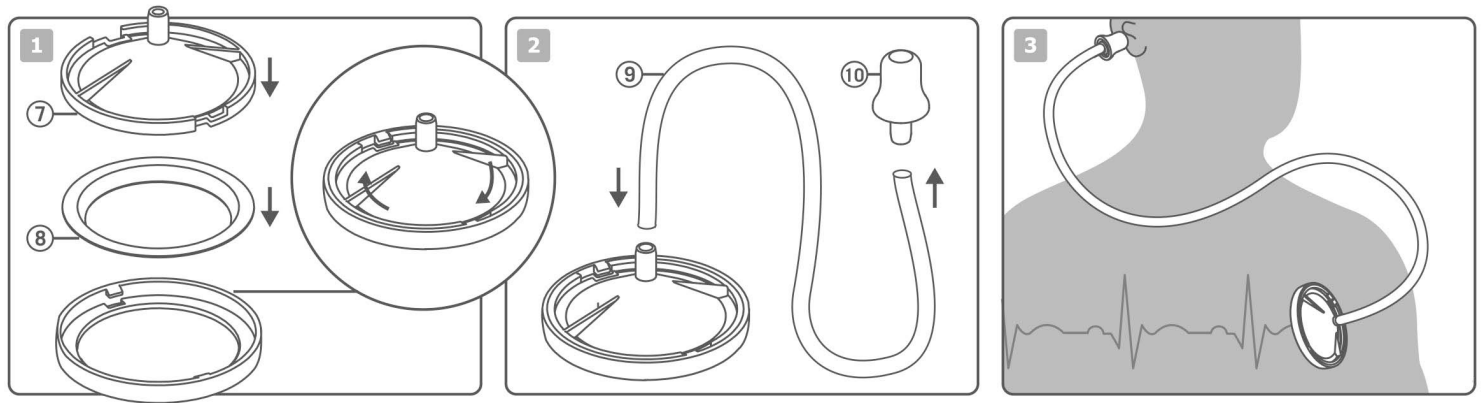
FUN FACTS:

- The brain is made up of three parts: the left cerebral hemisphere, the right cerebral hemisphere, and the cerebellum and brain stem. The left and right hemispheres are constantly communicating with each other and perform very different operations. The left side is dominant in processing language, logic and mathematical skills. The right side helps comprehend visual imagery, controls spatial ability, music and facial recognition. To further divide the brain, the cerebrum is formed by four 'lobes'. The Frontal Lobe is associated with reasoning, planning and problem solving. The Parietal Lobe controls movement and recognition. The Occipital Lobe helps visual processing. And the Temporal Lobe handles auditory processing and memory. The brain stem controls the flow of messages between the brain and the rest of the body, and also controls basic bodily functions.
- The brain is made up of around 150,000 miles of blood vessels. When it is overheated, yawning helps cool it down.
- A brain produces almost enough energy to power a lightbulb – when we first wake up, it has around 30 watts.

E. ACTIVITY 3 – STETHESCOPE:

The stethoscope is an essential part of every doctor's medical kit, and is used to listen to heartbeats, lung sounds and blood flow.

From kit: flexible tubing, clear plastic dome, blue disc, diaphragm, Earpiece



ASSEMBLY AND OPERATION:

- 1.** Take the clear plastic dome, blue disc and diaphragm and fit them all together. To do this, first take the blue disc and insert the plastic dome so that the raised face points downwards and sits flatly on the edge of the blue disc. Next, take the diaphragm and place it on top of the blue disc. Push down hard and twist it in a clockwise direction so it stays firmly in place. You have created the first part of your stethoscope.
- 2.** Attach the flexible tubing and the earpiece to the diaphragm. You are now ready to use your stethoscope.
- 3.** Make sure there is minimal noise and be attentive whilst you're testing your heartbeat, as the heartbeat might sound very faint. Insert the earpiece into your ear, then take the diaphragm and place it gently onto your chest. Move it around to locate your heart. This will enable you to check your heartbeat and hear what sound it makes. Try this with your parents or pets, too!

Extra Experiment 1: If you want to check your lungs, place the stethoscope over your lung cavity. The heart and lungs make very different sounds when you listen to them – can you spot the difference and describe what each sounds like?

Extra Experiment 2: Why not listen to your food being digested? Place the stethoscope on your stomach and hear it gurgle. If you have a willing pet, you could try to listen to its heartbeat to see how it differs to the human heartbeat.

HOW DOES IT WORK?

A stethoscope is like a speaker that amplifies sounds in the human body. When the diaphragm is placed on a person's body, sound waves inside the body make it vibrate. These waves are then amplified inside the tubing and travel up into the earpiece, allowing doctors to hear what's going on in the human body. How cool is that?

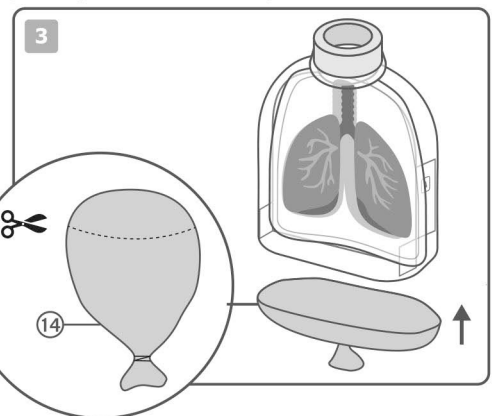
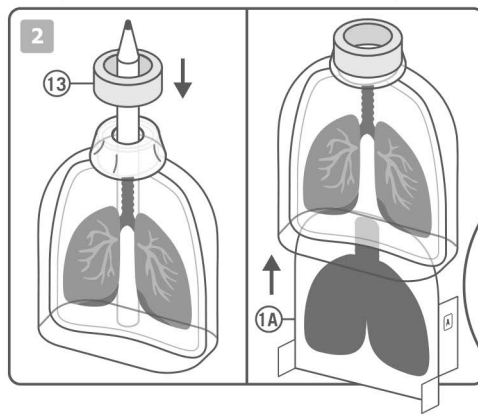
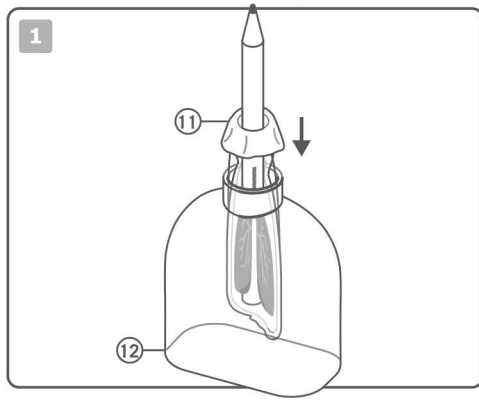
FUN FACTS:

- The heart is one of the most important organs, continuously pumping blood around our body through blood vessels.
- Your heart is roughly the size of your fist. It has very strong muscles and valves to keep blood flowing in only one direction. It does more physical work than any other muscle in the body.
- The 'lub-dub' sound of a heartbeat is made by the four heart valves closing.

F. ACTIVITY 4 - LUNG MODEL:

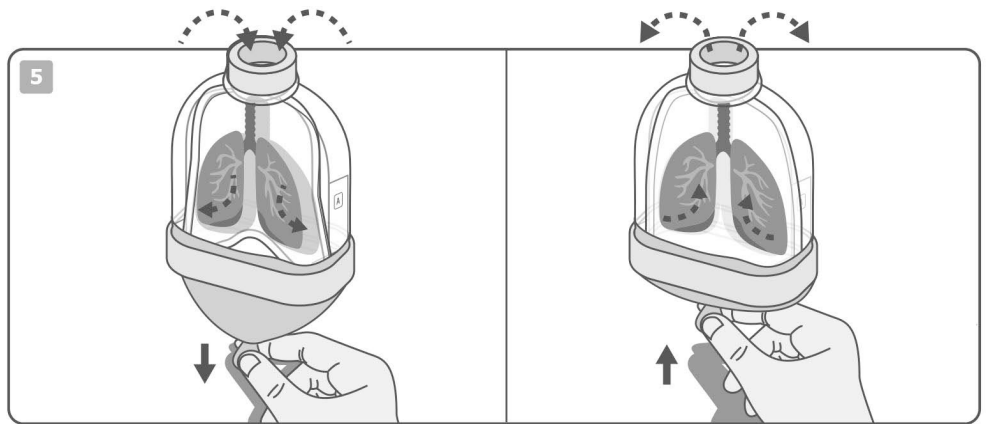
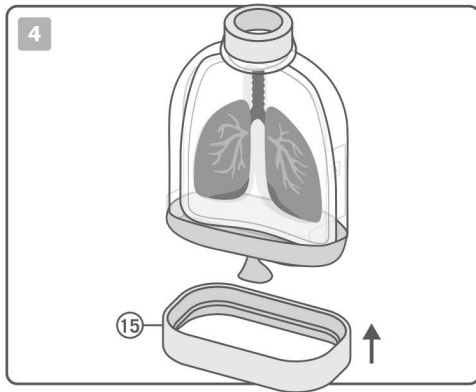
Humans breathe thousands of times a day without even thinking about it. It's your lungs that do all the hard work – discover exactly how they function here.

From kit: balloon, lung bag, cardboard lungs (Template 1A), blue base, blue lid, plastic lung cavity. **From home:** a pencil



ASSEMBLY AND OPERATION:

1. Insert a pencil into the lung bag, and fold down the upper half of the opening of the bag. Keeping the pencil inside, push the bag into the plastic lung cavity. Fit the bag opening around the opening of the cavity.
2. Secure this with the blue lid, then remove the pencil. Insert the cardboard lungs (Template 1A) into the plastic lung cavity, behind the lung bag.
3. Tie a knot in the end of an un-inflated balloon. Cut off the top half of the balloon; use the half with the end tied and place the balloon over the bottom of the cavity.



4. Secure the balloon by pushing the blue base.
5. Now pull the end of the balloon and watch the lung bag swell; release the balloon and watch it shrink. This is what happens thousands of times every day in the human body.

HOW DOES IT WORK?

In this model, the lung bag acts as the human lungs; the balloon acts as the diaphragm; the plastic lung cavity acts as the rib cage; and the blue lid acts as the trachea. Altogether, they form the chest cavity. Pulling the balloon reduces the pressure inside the cavity, hence drawing air into the lung. Releasing the balloon results in the opposite, increasing pressure inside the cavity and forcing air out.

Your diaphragm works the same way. When you inhale, your diaphragm contracts. The reduced pressure draws air into your lungs. You then absorb oxygen from the air. When you exhale, your diaphragm relaxes. The increased pressure forces the air out, expelling carbon dioxide. Isn't the human body fascinating?

FUN FACTS:

- Human lungs are one of the biggest organs in the body.
- The lungs are the only organs that can float on water, since they are greatly filled with air.
- The air you breathe out of your lungs contains waste products and carbon dioxide – and it comes out warm!
- An average person breathes around 23,000 times every single day.
- The main functions of your lungs are to bring oxygen from the air you breathe into your blood, while at the same time removing carbon dioxide through the air you breathe out.
- Most vertebrate animals (animals with spines) have two lungs.
- Can you live with only one lung? Yes, you can. It would limit your physical ability, but wouldn't stop you from living a relatively normal life. There are many people around the world living with just one lung.
- You can easily breathe through your nose or mouth, but horses can only breathe through their noses. They have a tissue sealing the oral cavity which prevents them from breathing through their mouth.

QUESTIONS & COMMENTS:

We treasure you as a customer and your satisfaction with this product is important to us. In case you have any comments or questions, or you find any parts of this kit missing or defective, please do not hesitate to contact our distributor in your country, whose address is printed on the package. You are also welcome to contact our marketing support team at Email: infodesk@4M-IND.com, Fax (852) 25911566, Tel (852) 28936241, Web site: WWW.4M-IND.COM

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WARNING:

CHOKING HAZARD-Small parts.

Not for Children under 3 years. Children under 8 years, can choke or suffocate on uninflated or broken balloons. Adult supervision required. Keep uninflated balloons from children. Discard broken balloons at once. Balloon is made of natural rubber latex.

Blind Spot

Frontal Lobe

Parietal Lobe

Occipital Lobe

Temporal Lobe

Brain Stem

Cerebellum

Left Brain

Right Brain