

Minor Challenge Set #1

STEM Field: Biology / Biomedical Engineering

Level: Junior

Challenge Name: Build Your Own Lung Model

Project Cost: 0-20 USD

Materials Required:

- 1x empty plastic bottle, or plastic cup
- 1x straw
- 2x deflated balloons
- Tape
- Scissors

Safety:

- Adult assistance is required when handling scissors or other sharp objects.

Duration:

- The challenge take approximately 1-2 hours to finish, however, the time guideline is an estimation only, and students and mentors can complete the tasks around their schedules

Introduction:

Did you know, you can survive approximately three weeks without food, three days without water, but only three minutes without air?

You may not realise it, but we breathe in and out about 15-25 times every minute. Every organ in our bodies needs oxygen to function, and our respiratory system powers us with oxygen. Our lungs breathe in air,

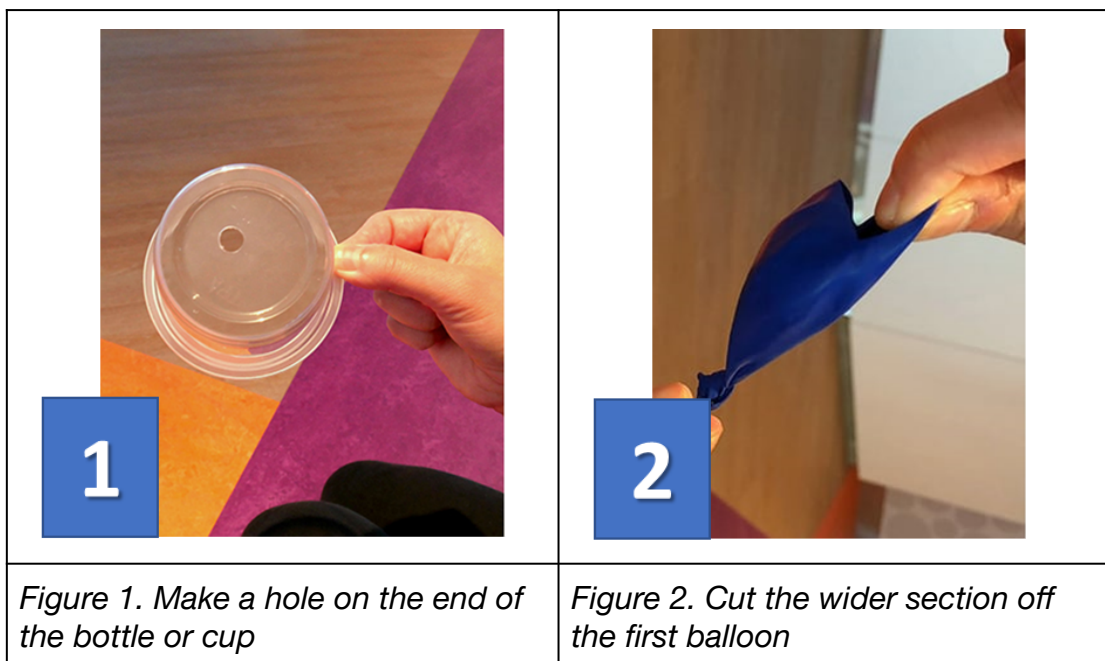
remove the oxygen and pass it through our bloodstream to carry to other parts of the body. The lungs also take carbon dioxide from our blood and release it into the air as we breathe out.

In this project, we will create our own lung model and observe how it works.

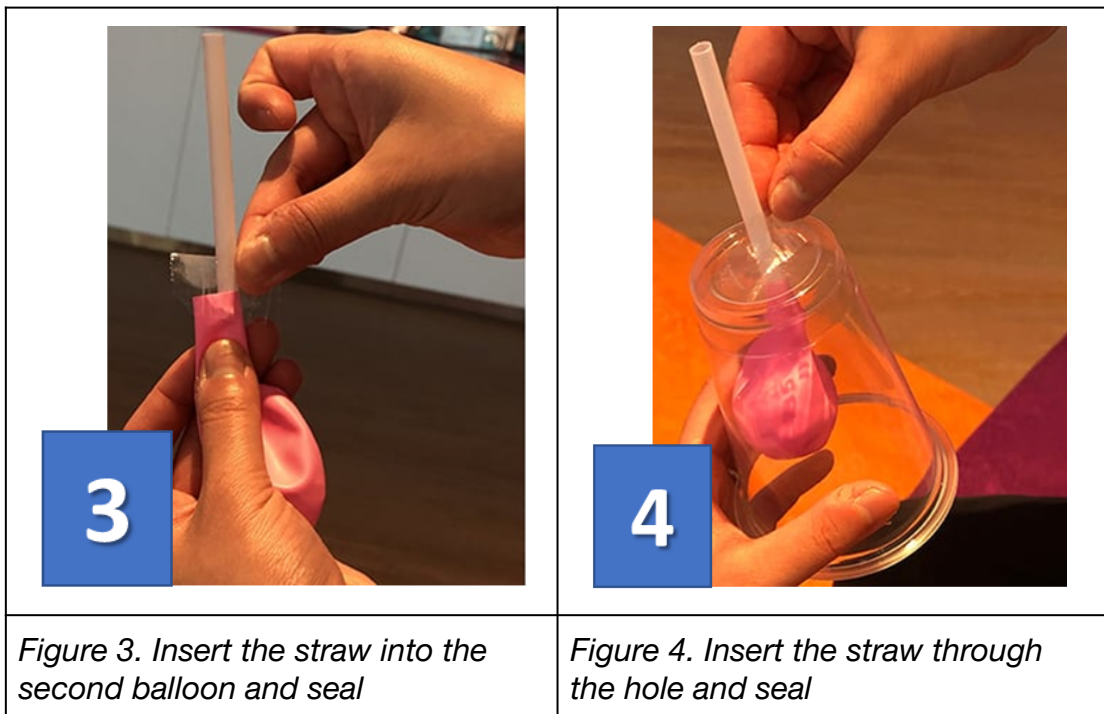
Instructions:

Note: Adult assistance is required when handling the scissors in steps 1 and 2.

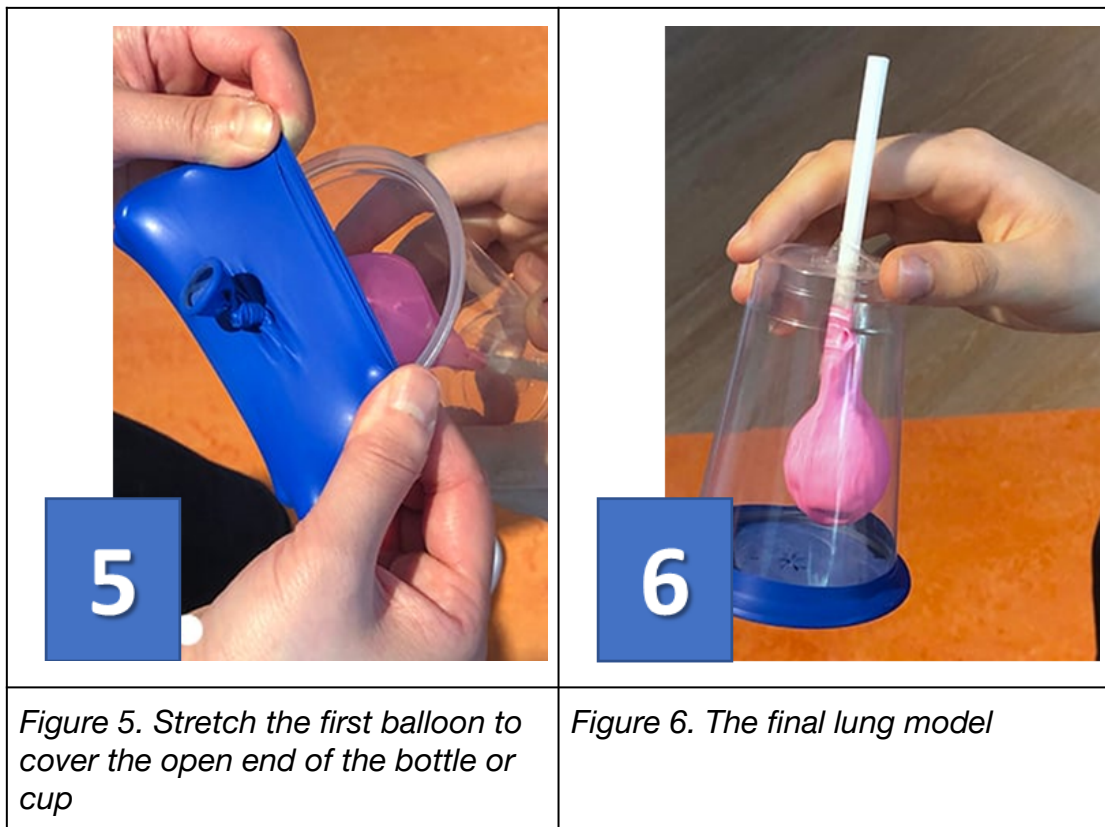
1. Use the scissors to make a hole at the bottom of the plastic bottle or cup. The hole should be big enough to fit the straw through.
2. Tie the neck tip off of the **first** balloon, then use the scissors to cut the wider section off. This balloon will be used to cover the open end of the plastic bottle or cup, so be careful when cutting the wider section of the balloon.



3. Insert the straw into the **second** balloon, and seal the opening with tape.
4. Pull the straw through the open hole in the bottle or cup until only a small section is showing. Then seal the hole with tape.



5. Take the **first** balloon and stretch over the open end of the bottle or cup to cover it completely. Secure the balloon with tape.
6. The final lung model is shown in Figure 6.



7. Hold the bottle or cup, then pull the knot of the balloon at the bottom away from the bottle or cup to inflate the balloon inside.

So, what happened?

The straw that is inserted into the second balloon represents the **bronchi**. The first balloon used to cover the open end of the bottle or cup represents the **diaphragm**, and the second balloon fitted inside the bottle or cup represents the **lung**. Finally, the water bottle represents the **rib cage**.

Our lungs, bronchi, and the diaphragm are protected by the rib cage. In our bodies, the bronchi are two large tubes that carry air to your lungs. The diaphragm is located below the lungs, and is a muscle that helps you breathe in and out.

As the first balloon (represents the diaphragm) is pulled, it creates more space in the bottle or the cup. The air travels down through the straw

(represents the bronchi) to fill the space and inflates the second balloon (represents the lung). When the balloon (diaphragm) is released, it pushes out the air from the balloon (lung), causing the balloon (lung) to deflate.

Extension

We have two lungs in our bodies. Can you build a working model with two lungs?

What would happen to the breathing process if a body part is not in a normal condition? For example, make a hole in the balloon (diaphragm) and observe what happens to the lungs if the diaphragm is damaged.

Reflection Questions:

- Are there any improvements you would make to this challenge?
- Take a few deep breaths. What do you notice about your chest with each breath as you breathe in and out?
- In addition to helping us breathe in and out, can you list 2-3 additional functions of the respiratory system?
- Can you list 1-2 conditions or illnesses that can affect the respiratory system? Can you explain in 1-2 sentences how the condition affects our respiratory system?

Submission Guidelines:

- Submit photos of your lung model. Include a short summary that addresses the reflection questions.

Note: Remember, if you want to upload pictures of your Minor Challenge that also include you, please check if it is OK with your parent or guardian first.

- The submission form is on the Minor Challenges page:
<https://sciencechallenge.org.au/index.php/minor-challenges/>
Fill out the details and make sure you upload your submission.

Learn More! Resources:

- Learn more about our respiratory system -
<https://www.ducksters.com/science/breathing.php>.

You may also like to complete a quiz to test your knowledge on how breathing works through this link -

https://www.ducksters.com/science/quiz/breathing_questions.php.

Bibliography:

- *Breathing* (no date) *Breathing* | Canadian Lung Association. Breathing | Canadian Lung Association. Available at:
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- Ellis, T., Schaefer Zarske, M. and Yowell, J. (2006) *Creating model working lungs: Just breathe - activity*, *TeachEngineering*. Engineering University of Colorado Boulder. Available at:
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- *Science at home: Build A lung model!* (no date) *Telethon Kids Institute*. Telethon Kids Institute. Available at:
<https://discoverycentre.telethonkids.org.au/activities/science-at-home-build-a-lung-model/> (Accessed: March 13, 2023).