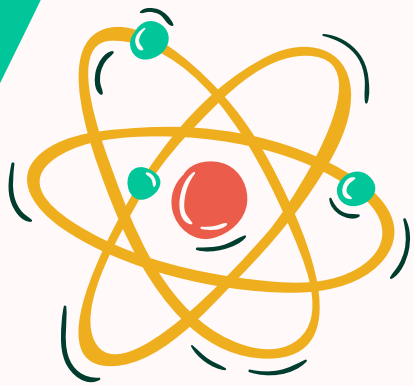
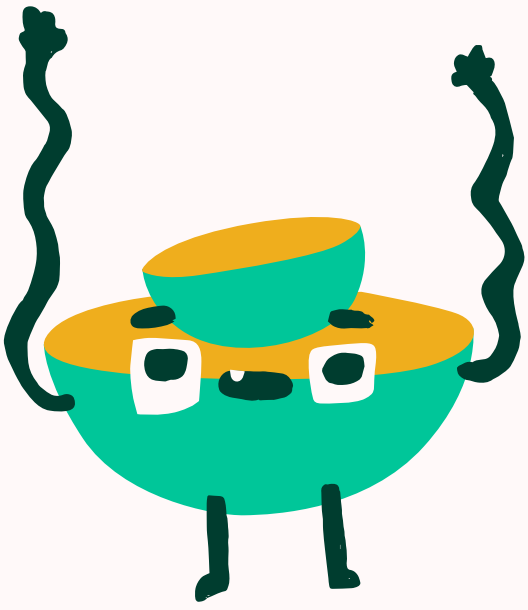
BALLOON INSIDE A BOTTLE

Time: 15 mins
Age: 6 - 12 years





Science Fuse
/spark your neurons

Key Concepts

- Air Pressure
- Atmospheric pressure
- Forces
- Principle of vacuum cleaning
- Pressure inside straws

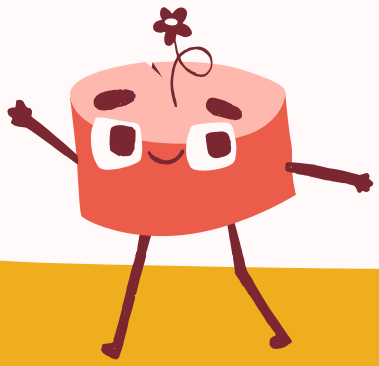
Learning Outcomes

- The student will be able to understand what air pressure is, and how air goes from higher pressure to lower pressure.
- The student will learn about the role of air pressure in machines such as a vacuum cleaner, or materials part of our everyday life such as straws.

What's the Challenge?

Greeting to another challenge, my fellow scientists! Today, you will have to use your superpowers as a scientist because although the experiment is easy, you have to figure out HOW to do it! My cousin Imama challenged me, and it took me a very long time to figure out how. So, let's see how long it takes you to solve this mystery.

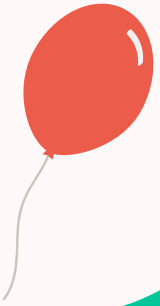
If I ask you to blow a balloon, that's something very easy to do! But what if I ask you to blow a balloon inside a bottle? Do you think you can do it? Think again, my friends! Because we are about to perform an experiment which will completely surprise you! And guess what? This mystery has something to do with a kind of force called PRESSURE. Now, let's proceed!



Materials Required

1. A plastic bottle (Coca Cola or Mountain Dew)

2. A balloon



3. Scissors/compass

Lay out the materials in front of you!

Let's do it!

Step 1

Take a balloon, and put it inside the bottle by wrapping its open end on the mouth of the bottle.

Step 2

Now, it’s time to use your breathing power! Take a long breath and try to blow air inside the balloon! Is the balloon inflating? No, it’s not! Even if you keep trying, I don’t think you will be able to inflate the balloon! What do you think?

Well, is there a way we can inflate the balloon inside the bottle? There must be!

Note: It's very important that you ask an adult for help in the next step.

Step 3

Take a scissor, and poke a hole near the bottom of the bottle. Make sure the hole is smoothly made, and doesn't have any rough edges! You may hurt yourself otherwise.

Step 4

Can you now try again and blow air inside the balloon? Is the balloon inflating and growing in size now? Yes, it isssss! You truly are a brilliant scientist! But why wasn't this happening before without the hole? Keep thinking!

But the balloon keeps shrinking after we stop blowing inside it! Is there a way we can keep it inflated inside the bottle for a long time without blowing air into it again and again? Can you think of a solution? Well, try this, my fellow scientists!

Step 5

As soon as you blow air inside the balloon, quickly shut the hole with your finger! ARE YOU SURPRISED YET? ISN'T THIS AWESOME?

Results and Observations:

Well, my fellow scientists, we successfully observed that blowing a balloon inside a bottle is not possible, but it can be made possible by poking a hole in the bottle. If we want the balloon to stay blown inside the bottle, all we have to do is put our finger on the hole. But why is this necessary? Why is poking a hole necessary, and why do we need to put a finger on it to stop the balloon from shrinking?

Science Behind It!

So, how did the challenge go, my friends? It took me some time to understand what's going on in this experiment too! But then I remembered that it's what scientists like you and I do! We think hard, and we try to solve these puzzles! So, are you ready to join me on a journey to understand what the science behind this experiment is? Let's go!

Your first challenge was to put the balloon inside the bottle, and blow air into it. But we couldn't do it, right? No matter how hard you blew air inside the balloon, it wasn't getting any bigger! Why is that?

Well, when you look at an empty bottle, it's not really empty. Just like there's air everywhere around you, there's air inside an empty bottle as well. The air can easily enter and leave the bottle if the bottle is open, but once you put a balloon inside, the air inside the bottle cannot escape! It's stuck inside it! Which means that there is lots of air pressure inside the bottle! So, when you're blowing air inside the balloon, the balloon cannot inflate because the bottle is already filled with air. There is no space for the balloon to expand. Even if you do try and blow hard, the air always comes back out of the balloon.

Ughhhhhhh! But we really want our balloon to inflate inside the balloon! How do we do that? What can we do to create an easy escape for the air inside the bottle? The future of science is upon us, my friends! Think! It's something that you did in this experiment as well!

Well, well, you made a hole in the bottle! Now the balloon can easily push the air outside the hole and make room for itself! Whoa, the balloon is a mastermind at work! Now your balloon can easily inflate because there is very less air pressure inside the bottle!

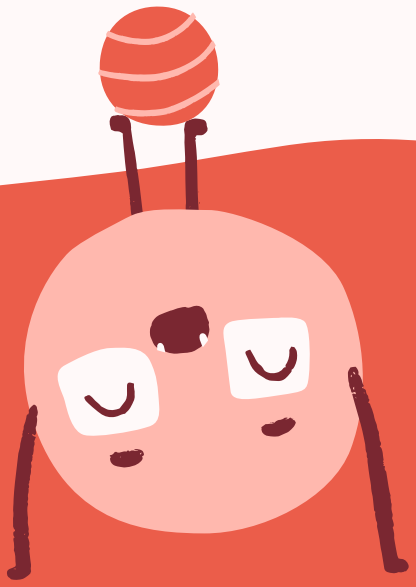
But what happens when you blow air inside the balloon, and then immediately shut the hole with your finger? Why doesn't the balloon shrink then? It stays the same even though its mouth is open! HOW IS THAT POSSIBLE? WHY ISN'T THE AIR COMING OUT? SO MANY QUESTIONS!

But we have answers! HA HA HA! The balloon doesn't shrink because when you shut the hole, the air outside the bottle can't enter through the hole. Since it can't enter, it cannot push the balloon back! But as soon as you take your finger off, the air enters the hole, pushes the balloon up and all of the air inside the balloon comes out of the bottle and our balloon shrinks! It's like a constant fight between air and our balloon! That's so awesome!

THE WORLD AROUND YOU!

Well, we all saw how the air pressure helped us blow a balloon inside the bottle! This is the amazing air at work, which always goes from an area of higher pressure to an area of lower pressure.

Did you know that many things around you work using the same principle of air pressure as well? The straw you use to drink, the vacuum cleaner you use to clean carpets; all of them work using the same principle! Whenever you suck on a straw to drink something, you are literally sucking the air out of it! The air pressure inside the straw decreases, and the air pressure outside the straw increases. Which is why the air outside the straw pushes on your drink, and then travels up the straw!



QUIZ

- Air contains many gases and every gas has a pressure of its own. What gases are found in the air?
- Do you think liquids also have pressure? Do they also move from an area of high pressure to an area of low pressure?
- When we put a finger on the hole in the bottle the balloon remained inflated. Why did the air not leave the opening of the balloon? Hint: The atmospheric pressure is different.
- Does temperature affect air pressure? Think and investigate.
- Can you find out the name of the device used to measure pressure?
- Can you explain what happens when we breathe in air through our noses? Where do you think the pressure is higher, inside or outside our body?