

MONSTER SCIENCES

Making science fun!

AN EXPERIMENT ABOUT

AIR

BALLOON IN A BOTTLE

What you will need:

- A large empty plastic drink bottle
- A thumb tack or push pin
- A balloon

What you will do:

1. Place the balloon inside the bottle and loop the mouth of the balloon over the mouth of the bottle.
2. Now blow the balloon up inside the bottle. **CAN'T DO IT? WHY IS THAT DO YOU THINK?**
3. Lay the bottle down on its side and carefully poke a hole in the bottom of the bottle. Now poke another 2 or 3 holes right beside the first one so that the hole gets a little bigger.
4. Now try blowing up the balloon in the bottle.
5. Here's an extra trick: as soon as you are finished blowing, put your finger over the hole. Take the bottle from your mouth, keeping your finger on the hole but don't cover the end of the balloon. The balloon stays blown up! **IT'S AMAZING!**

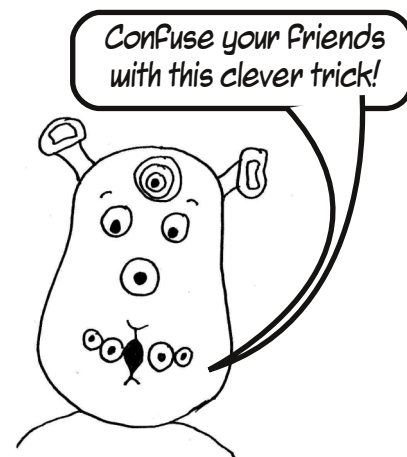


What is going on?

Even though we can't see the air in the empty bottle, it is there and it's taking up space. When you try to blow up the balloon, you are trying to add extra air to the bottle, but there is no room for it. When you put a hole in the bottle the air from the bottle can escape when you blow new air into the balloon. If you put your finger over the hole you stop outside air getting back into the bottle, so it can't rush in and push the air out of the balloon - the balloon stays blown up.

Monster Challenges:

- How could you use this experiment to trick your friends? Perhaps you could give them a bottle without a hole, and challenge them to a balloon blowing race. Or you could challenge them to make a balloon stay blown up without closing the mouth of the balloon.
- How else could we get the balloon to inflate without the hole in the bottle? What do you already know about air compression and air temperature that might help?



TEACHING NOTES:

Monster Sciences Experiment: Air A09

Topic: Air

Suitable for Ages: 8 -12+

Key Concepts:

Air takes up space.

Resources:

- Experiment Description Air A09 – one copy per student
- Investigation Report IR01 - one copy per student
- large empty drink bottles, balloons, thumbtacks, pens

Lesson Notes:

I always do this experiment in pairs or small groups so that they can discuss their observations and discoveries. Begin by explaining the experiment and reminding students of your safety requirements regarding the thumbtacks. It doesn't matter where the hole i put in the bottom on the bottle but I suggest that they think about how they are going to put their finger over it later so that they put it in a sensible place. They can also cover the hole with tape or poster tak later if they want to trick someone else.

Remind students to listen carefully to instructions, and to OBSERVE their experiment.

As a class discuss the experiment prior to undertaking it, and students should complete the sections of their Investigation Report IR01 from "Title to "Hypothesis".

What should happen in this experiment, and why?

Without the hole in the bottle the balloon can't be blown up because the bottle is already full of air so no more air can be blown into it. Once the hole is in the bottle, the air from the bottle can escape and the balloon can be inflated. If the hole in the bottle is then covered, it will prevent the air flowing back into the bottle, otherwise it would push the air back out of the balloon.

These Monster challenge questions are about thinking about what they already know about air and applying it to this current experiment. Students should already be aware that cold air takes up less space that hot air, so they should be able to suggest cooling the air in the bottle. You may enen like to give it a go. They should also know that it is possible to compress air, but our lungs are not strong enough to do it for this experiment. Students may suggest other ways to compress the air in the bottle like using a bike pump to fill the balloon.

Follow up question:

- Would this experiment change if we used a bigger bottle? A smaller one? [no, no matter how big or small the bottle is it will still be full of air]