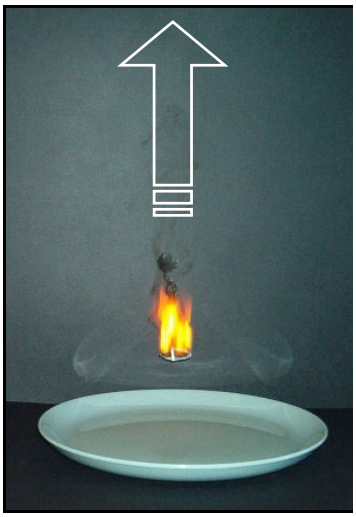
Teabag Thermals

This demonstration works best in a very still room – a good one for winter!

Materials: Teabag(s) / Still room / Matches / Saucer or plate / Water or wet tea-towel (for safety)



Instructions:

- This demonstration works best in a very still room – switch off ceiling fans and close windows for the duration of the demonstration and be careful not to breath too heavily in the direction of the teabag.
- Carefully remove the staple and string from a teabag.
- Open the teabag and discard the contents into a bin or a cup. You will see that a teabag is really just a paper cylinder folded in half.
- Open the teabag up so that it can stand upright on the saucer or plate.
- Light the top of the teabag with a match and allow it to burn down.
- Just before the flame reaches the table, the teabag will lift off. The flame will burn out in mid air but the burnt teabag will continue to rise. Depending on the conditions, the teabag will reach the ceiling before gently falling back to the ground. You can easily catch the slowly falling teabag.

Explanation:

Heat is released as the teabag burns. This heat creates a narrow column of warm, rising air – a miniature thermal current. As the teabag burns, it also becomes much lighter. When it is almost completely burnt, the teabag is light enough to be lifted up by the tiny thermal current rising up above it.

Safety note:

Emphasise the safety precautions you are taking before performing this demonstration and insist that students only attempt this demonstration under the supervision of an adult.

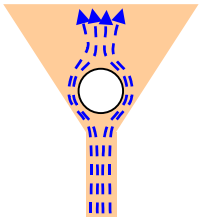
Ping-Pong Pressure

An amazing demonstration of Bernoulli's Principle kids can repeat at home

Materials: Ping-pong ball / Blow-dryer / Funnel / Black marker / Tissues

Instructions:

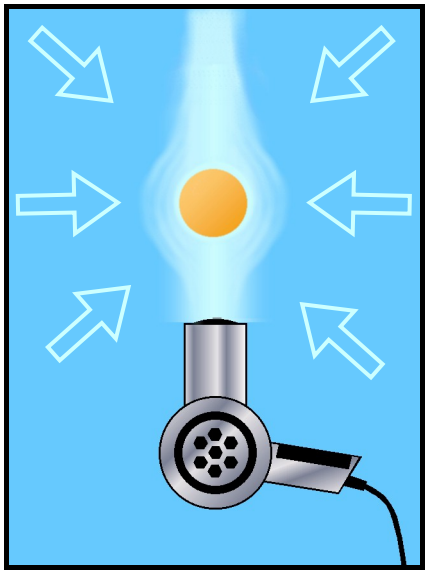
- A black mark on the ping-pong ball will make any motion more clearly visible. You can make a clear funnel by cutting the top of a soft-drink bottle as illustrated (some coloured electrical tape has been added for decoration).
- Show the class the ping-pong ball and funnel and set a simple challenge: "Who thinks they can blow the ping pong ball out of the funnel?"
- Pick three students to try it (clean the end of the funnel with a tissue after each student's turn). Tell the class it was a trick question that can't be done! Ask if anyone can explain why it is impossible.
- Reproduce the illustration of the ball and funnel without the blue lines, and ask for suggestions about *how* the air might flow around the ball. When you have established that the air flows around the ball, draw on the blue lines.



- On the diagram of the funnel, point out that there is fast moving around the ball, and slow moving air further away from the ball. Because fast moving air is at a lower pressure than slow moving air, the ball gets trapped in an area of low pressure. The air further away from the ball is exerting pressure on the ball to keep it stuck inside the funnel when you blow.
- Now show the class the blow-dryer and turn it on so that it blows vertically toward the ceiling.
- Ask the class to predict what will happen if you put the ping ball into the blow-dryer's airstream and let it go. When they have had sufficient time to make a prediction, perform the demonstration. The ball will hover in mid air.
- If you put the funnel in front of blow-dryer's air-stream, the ball will hover much higher. You can even tilt the hairdryer so the ball hovers away from the blow-dryer.
- Ask if anyone would like to have a go at drawing the airstream around the ping pong ball on the board (alternatively, each student could draw it in their books).

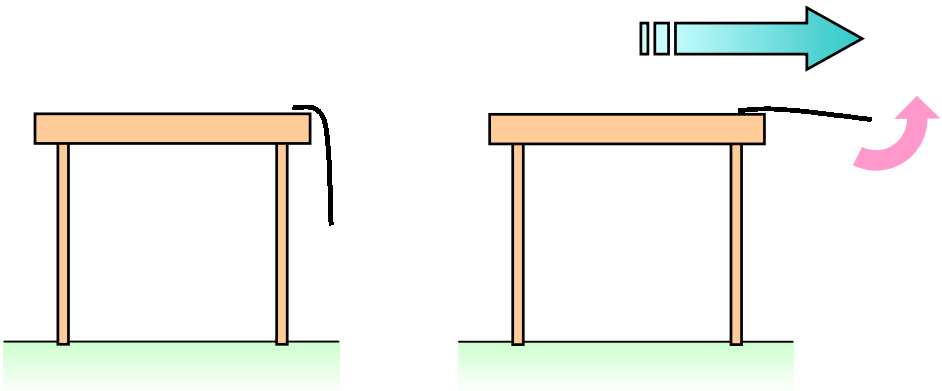
Explanation:

Bernoulli's Principle states that fast moving fluids (gases and liquids) are at a lower pressure than slow moving fluids. The blow-dryer's airstream rushes around the ball creating a region of low pressure, represented below in lighter blue. The surrounding air is not moving quickly so it is at a higher, represented below in darker blue. The air at higher pressure traps the ball in a pocket of low pressure and keeps it in a surprisingly stable position.



High pressure traps the ball in the low pressure air-stream

To clearly demonstrate that fast moving air is at a lower pressure, lay a piece of paper over the edge of a table so that most of the paper is hanging down. Use the blow-dryer to blow air across the top of the paper. This creates a region of low pressure above the paper while the air below it remains at a higher pressure, causing the paper to lift up.



Blow air across a sheet of paper and it will lift up

Safety note:

Blow dryers should not be operated continuously for too long (refer to the instruction manual).