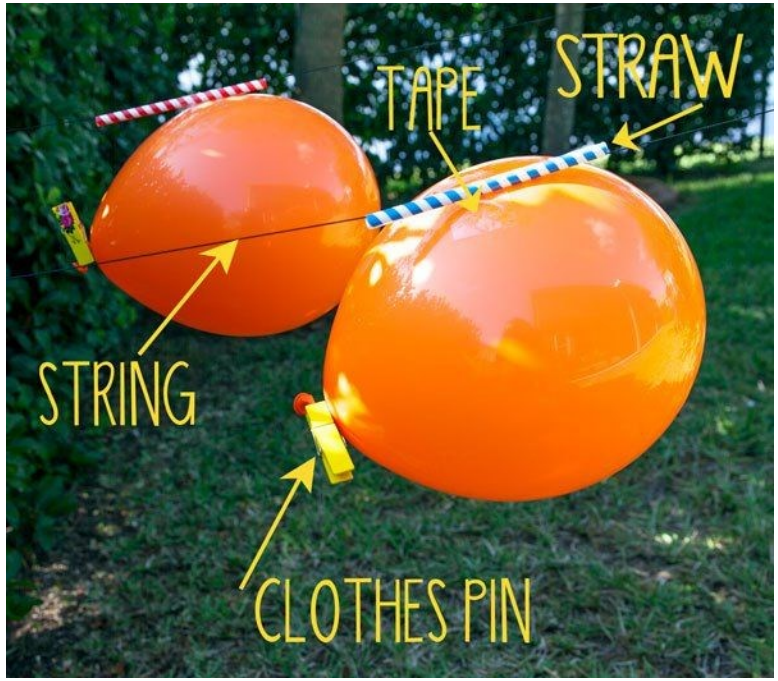
Experiment #1: Balloon Races

How many breaths does it take you to blow up a balloon?
Is it the same for every person?

All that breathing is hard work! Where does the energy go?

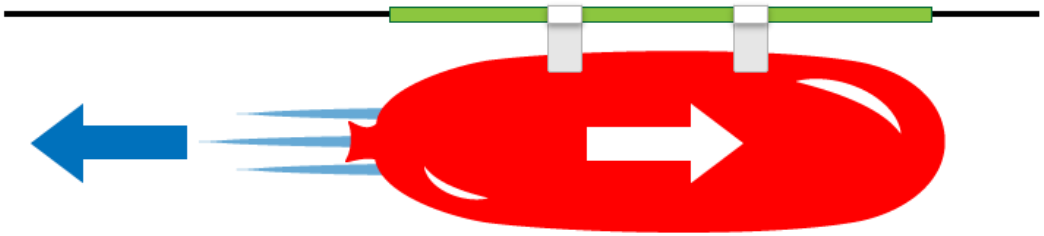
If we make balloon "rockets," will a bigger balloon be slower or faster than a small balloon? Time them!



The air surrounding us has pressure, about 15 pounds per square inch (psi).
When we blow into a balloon, we increase the air pressure inside of it.
The more air we put in, the greater the pressure.
The greater the pressure, the harder it is to blow into the balloon.
When we release the balloon, the air pressure pushes out until the air pressure inside the balloon is equal to the air pressure outside the balloon.

Make a Balloon Rocket

Put a long piece of strong through a straw. Tie or tape the string to walls or objects several feet apart. Now blow up a balloon. Don't tie it! Hold it closed with a clothespin. Tape the balloon to the straw. Now do the same thing again. You've got two balloon rockets, ready to race!

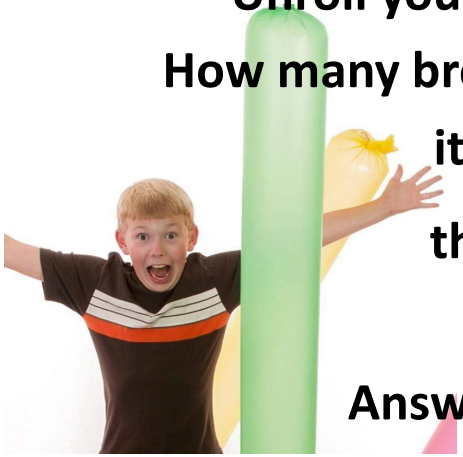


Could you make your balloon go faster without making it bigger? Try adding a nose cone and fins. These aerodynamic accessories will reduce the effects of air pressure around the balloon.

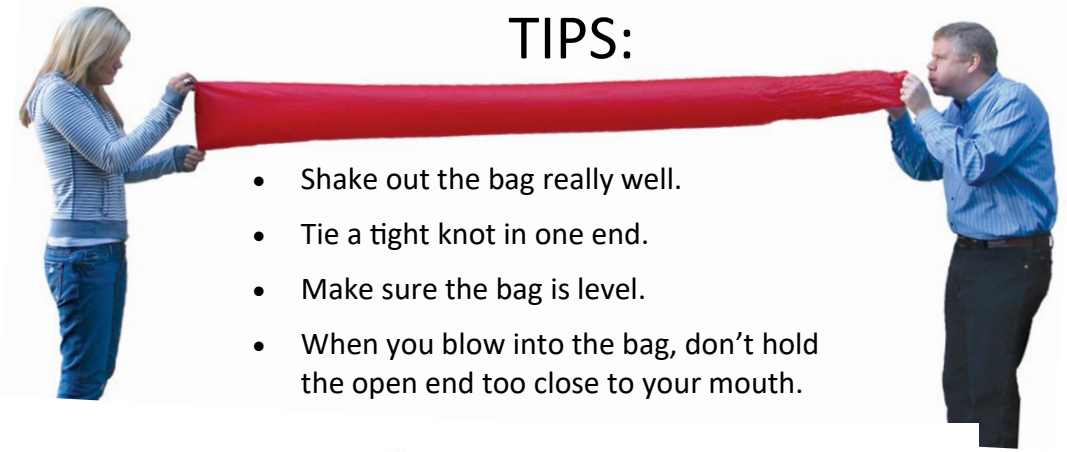
Experiment #2: The Bernoulli Bag

Unroll your Bernoulli Bag.

How many breaths do you think it will take to fill this big bag with air?



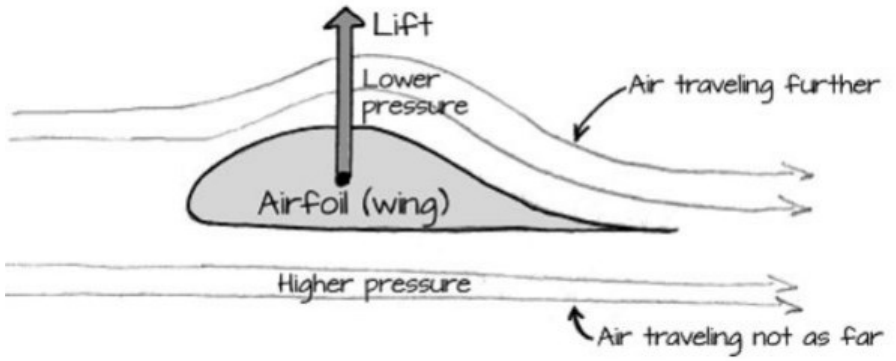
Answer: ONE BREATH!



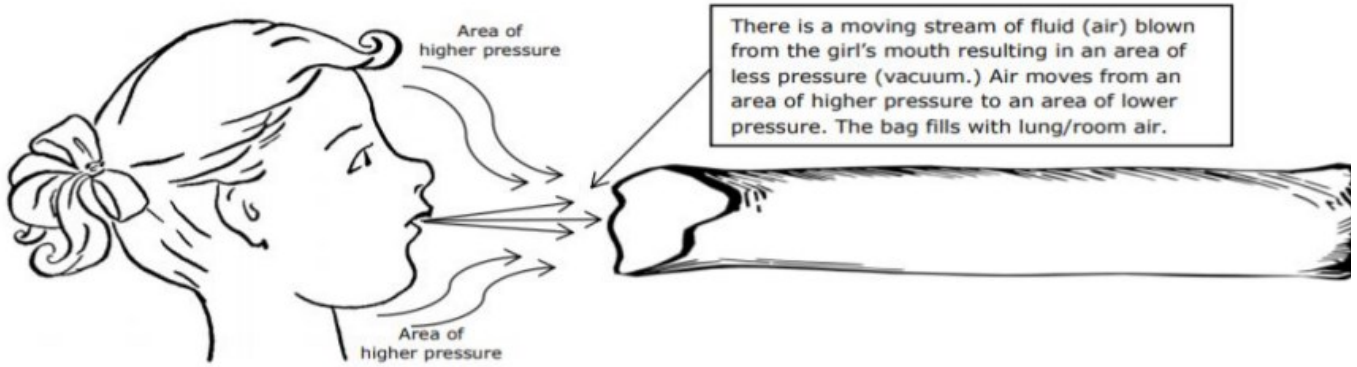
TIPS:

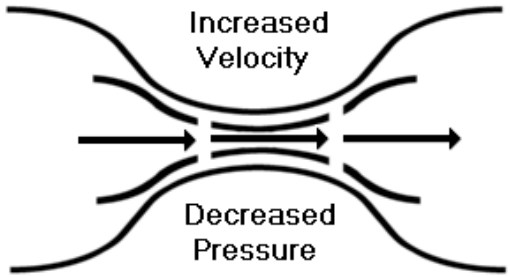
- Shake out the bag really well.
- Tie a tight knot in one end.
- Make sure the bag is level.
- When you blow into the bag, don't hold the open end too close to your mouth.

Bernoulli's principle is what allows an airplane's wings to generate lift. It also allows us to blow up big plastic "balloons" with one breath. Try it! Tie one end tightly shut. Have a partner hold out the bag horizontally. With your face several inches away from the opening, blow into the bag. Quickly scrunch the bag closed and tie off the end.



Within a flow of constant energy, when fluid flows through a region of lower pressure it speeds up and vice versa.





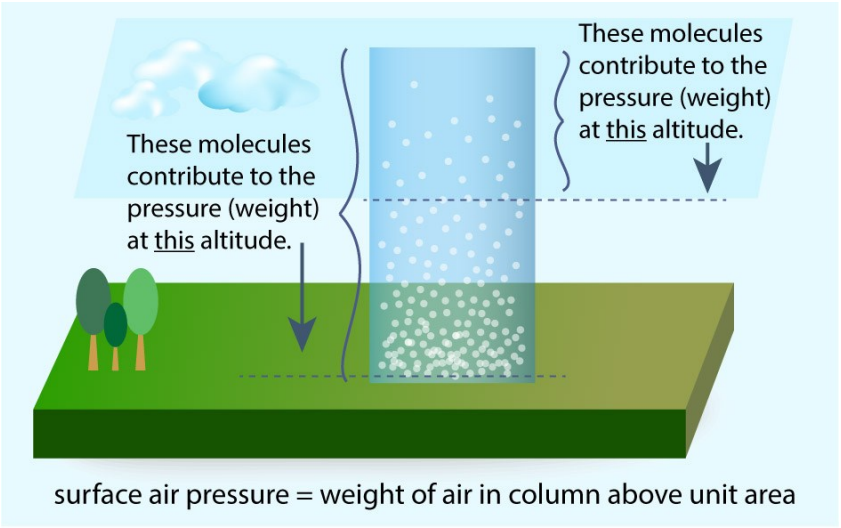
Experiment #3: Magic Water? No, Air Pressure!

Fill a cup one-third full of water. Cover the entire mouth of the cup with an index card. Holding the card in place, turn the cup upside down. Remove your hand from underneath. Voilà! Magic!

Why doesn't the water fall out?

Because the water inside the cup is held in place by about 14.7 pounds of force from the air pushing up, while the force of the water pushing down is only about one pound of force.

This experiment shows us ATMOSPHERIC PRESSURE.



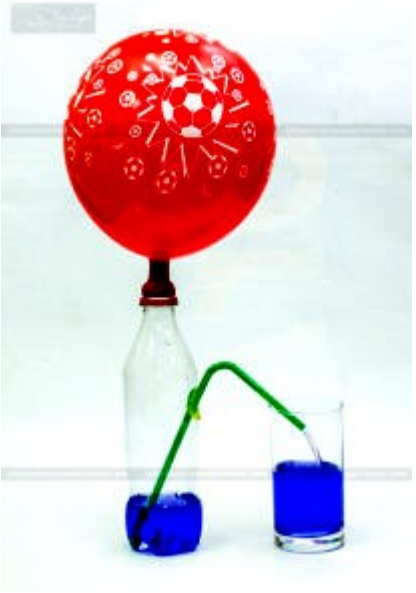
Atmospheric pressure is a force in an area pushed against a surface by the weight of the atmosphere of Earth, a layer of air. The air is not distributed evenly around the globe. It moves, and at different times, the layer of air is thicker in some places than in others. Where the layer of air is thicker, there is more air. Since there is more air, there is a higher pressure in that spot. Where the layer of air is thinner, there is a lower atmospheric pressure.

At higher altitudes, the atmospheric density and pressure are lower. This is because high places do not have as much air above them, pushing down. At high altitudes, air is colder because it is "thinner."

The effects of atmospheric pressure can also be seen when:
- our ears pop during on an airplane ride
- cold air makes our balloons shrivel up
- it can be harder to breathe at higher altitudes
- water boils at a lower temperature when you're higher up

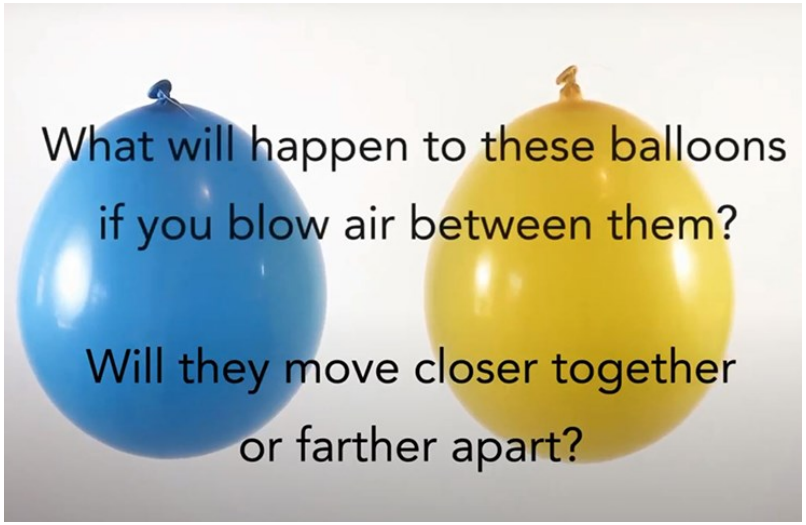
Experiment #4: Moving Water

Take an empty water or soda bottle and cut a small hole in the side.
Pour water into the bottle.
Put a straw into the small hole in the side.
Set a glass under the straw where it comes out of the bottle.
Blow up a balloon.
Fit the end of the balloon over the top of the bottle.
If necessary, tape the balloon to the bottle.
The pressurized air inside the balloon pushes the water through the straw.
Air pressure = power!



Experiment #5: Kissing Balloons

Blow up two balloons and attach a piece of string to each. Hold one balloon by the string in each hand and position the two balloons so that they are at your nose level and 6 inches apart. Blow hard into the space between the balloons.



This lowers the air pressure. The pressure of the surrounding air is now higher and it will push the balloons together.

This is another example of Bernoulli's principle!