Air is considered a fluid. Any substance that flows and takes the shape of its container is considered a fluid. Let's examine air further:

Properties of Air:

- AIR TAKES UP SPACE
- AIR HAS MASS
- AIR EXPANDS (IS AFFECTED BY TEMPERATURE)
- AIR CAN EXERT A FORCE (PRESSURE)
- AIR IS AFFECTED BY ALTITUDE

*READ AND COMPLETE AS MANY EXPERIMENTS AS YOU CAN. RESEARCH THE ONES YOU DO NOT HAVE MATERIALS TO COMPLETE. ALL EXPERIMENT PAGES WILL BE POSTED ON MY WEBSITE AND ON ONE NOTE.

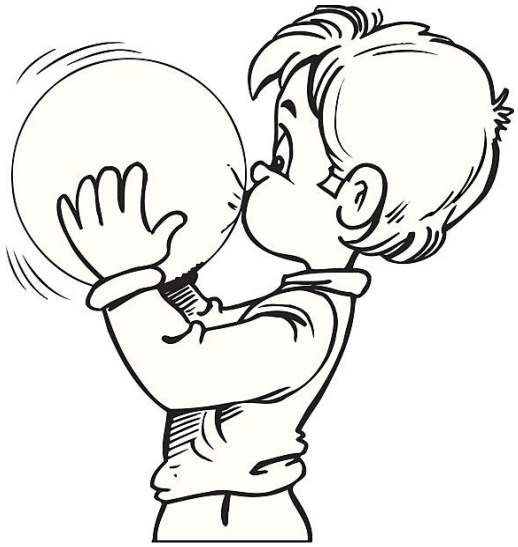
1) AIR TAKES UP SPACE:

Examine a cup from your cupboard. Is there anything in in? You may think no, but the answer is actually yes. What about a plastic bag. Take an empty sandwich bag, open it and pull it through the air like a parachute. Quickly close and seal it shut. Can you squish this bag? You shouldn't be able to. You're now thinking- there's nothing in the bag, right? Wrong. The ziploc bag is full of air! The bag may be "empty" but air is actually occupying the space inside.

You can also prove air takes up space by blowing up a balloon. The balloon expands because you are putting something into the balloon; air. This air takes up space, so the more air you put into the balloon, the more space it takes up. When you use a pump to blow up a volleyball, you put air into it - therefore air takes up space which is why the volleyball expands.

EXPERIMENTS TO TRY FOR YOURSELF: Complete these experiments at home if you have the materials OR research/find videos for these experiments.

- Tube in A Cup
- Diving Paper
- Huff N' Puff



2) AIR HAS MASS

Examine a balloon just taken out of the package. Does this balloon weigh anything? Placed this deflated balloon on a scale and weigh it. Observe. Now inflate the balloon, place it on the scale and weigh it again. What do you think would happen? The inflated balloon should weigh more!

A really clear way to show that air has mass is to make a balance with a stick or coat-hanger suspended by a string in the middle. On each end, tie an empty balloon. Do you think the weight should be balanced out? If you said yes, you are correct. Now inflate one balloon (blow it up) and rehang it. What do you think happens? Well, the side with the blown up balloon will be heavier and throw off the balance of the hanger. If air had no mass, the hanger should have remained balanced and there would have been no change.

AIR MASS EXPERIMENTS TO TRY FOR YOURSELF: Complete these experiments at home if you have the materials OR research/find videos for these experiments.

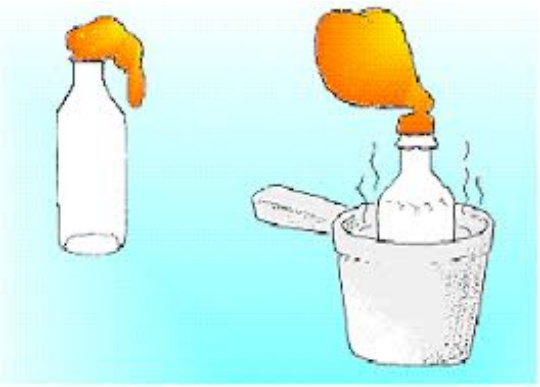
- Balancing Act

Extra Activity:

Every square inch of surface on the earth has about 15 pounds of air sitting on it. (Air is piled about 100 miles high on each square inch.) Just for fun, calculate the number of square inches on the top of your head and multiply it by 15. Wow... you are holding all that up!?!?

3) AIR IS AFFECTED BY TEMPERATURE

Air is affected when heated or cooled.



Try It! Take a balloon and place it over the top of a 2 litre pop bottle with just a little bit of water in it. Observe the size of the balloon now currently "at room temperature". Now take the bottle and hold it in a container of near-boiling water for 10 minutes. Observe the balloon- it should inflate! Next, take the bottle and place it in a container with some water and ice. What happens? Well, the balloon should deflate! Finally, let the bottle sit on the table for 10 minutes. You should now see the balloon return to the same size as it was to start. The balloon changes when the air molecules are heated or cooled.

The greater (hotter) the temperature, the faster the air particles move (increasing pressure) and hitting the sides of the balloon more often, quicker and harder, making the balloon inflate more.

The lower (colder) the temperature the air becomes, the slower the air particles move (lowering pressure), resulting in the same amount of air now taking up less space.

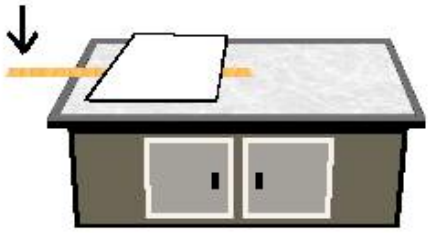
EXPERIMENTS TO TRY FOR YOURSELF: Complete these experiments at home if you have the materials OR research/find videos for these experiments.

- Adjust the Volume

4) AIR CAN EXERT A FORCE (PRESSURE)

*__Air Pressure__: Air has weight. Because air has weight, it pushes on things. This is called air pressure.

Imagine this: You take a metre stick and lay it on a table. Then you unfold a full page of a newspaper and lay it flat over the metre stick. You push down on the other end of the metre stick. YOU CAN'T LIFT THE SUPER LIGHT PIECE OF PAPER! Why!? This is because air exerts pressure (in all directions) and therefore stops you from lifting the newspaper.



Okay let's explain this:
The air above the paper pushes down on the paper- this is air pressure. This pressure is pushing down on the paper and the reason why the paper lays flat on the table. Even though they're too tiny to see, all the molecules of air in the atmosphere together have a very powerful force.
This is the reason why lifting heavy objects is hard to do. Imagine you tried to lift a small car or even your bed. You would definitely notice then that there is a tonne of air pressing down on the object causing you trouble when trying to lift it. Why do we not notice the air pressing down on us? In fact, the air exerts force in *all directions*, so as well as pushing down on us, it is also pushing up and therefore balances out the force on our bodies so that we don't collapse.

AIR PRESSURE EXPERIMENTS TO TRY FOR YOURSELF:

Complete these experiments at home if you have the materials OR research/find videos for these experiments.

- Feel the Force
- Test Your Strength

5) AIR IS AFFECTED BY ALTITUDE

The higher you are, the lower the air pressure. When you are higher up, there is less air above you to push the air down (therefore not as much air pressure forcing down). This is the danger that mountain climbers face - or the reason why those who attempt to conquer Everest use oxygen tanks. The air outside is too thin to breathe normally when reaching these extreme heights.

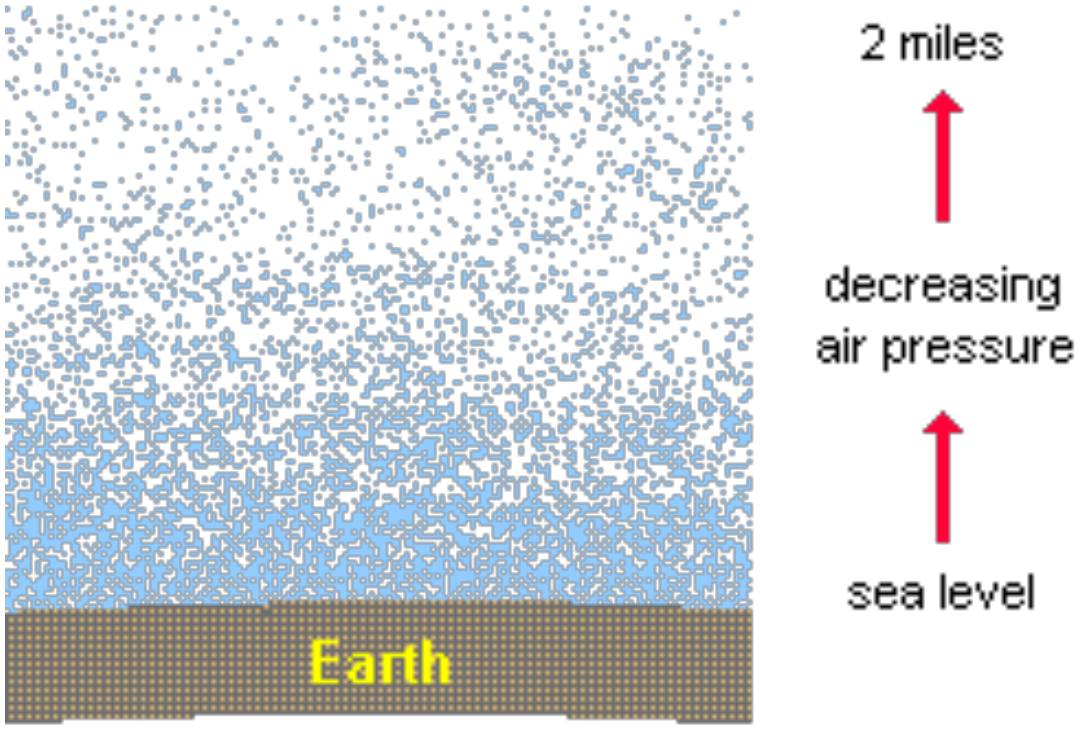
Our human bodies are used to this air pressure. The air pressure in our lungs, ears and stomachs are the same as the air pressure outside of our bodies, which is the sole reason we don't get crushed by air pressure.
Our bodies are flexible enough to cope when the inside and outside air pressures aren't *exactly* the same.

Airplanes are pressurized cabins to compensate for the lower air pressure at higher altitudes when flying. Despite this "man-made" atmosphere, the air pressure inside a plane is not the same as at sea level. You might have noticed that if you drink from a plastic bottle during a flight and put the lid back on, when you land the bottle will be crushed. This is because the air in the bottle is at the lower pressure of the airplane cabin and it can't withstand the higher air pressure at ground level.

You've probably also noticed that your ears pop during the take off or landing of a flight. This is caused by the difference in air pressure on either side of your ear drums and the only way to equalize the pressures is to yawn, chew gum or to breathe out while holding your nose.

WATCH THIS VIDEOS:

- Air Buoyancy



6) AIR CAN BE COMPRESSED

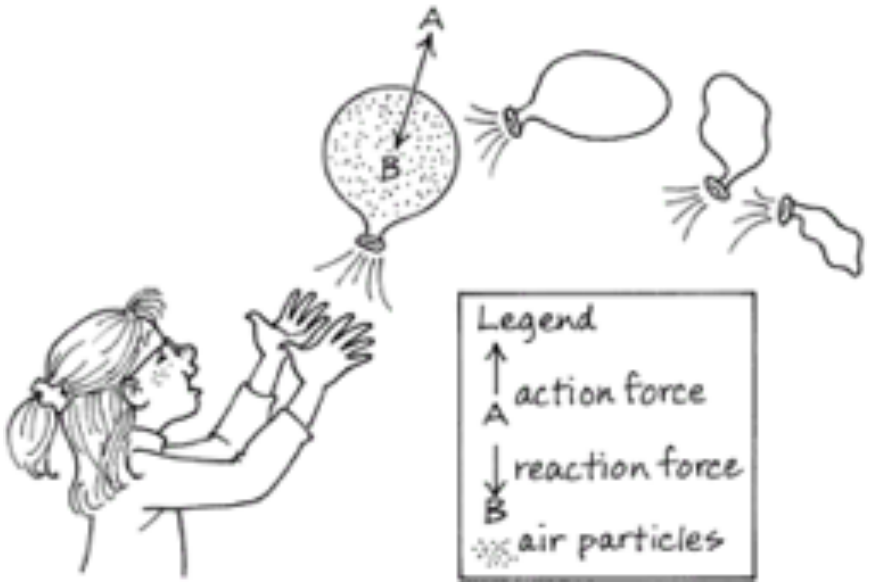
Compression: to squeeze or press together.
Try It! Use a plastic pop bottle. Take the cap off and hold your hand above the mouth (the top) of the bottle and squeeze. What do you feel? Screw the cap back on on tightly and squeeze again. What happens when you squeeze the bottle now? Next, fill the bottle completely with water, replace the cap and squeeze again. What do you feel now?

When you squeezed the bottle without a lid, you forced some of the air out of the mouth.
When you placed the cap tightly on the bottle and squeezed again, there was no place for the air to go, but you were able to squeeze the bottle together. This means that you were able to compress (or squeeze together) the air inside the bottle.
However, when you filled the bottle with water and had the cap on, you would be able to squeeze the bottle very much at all because you could not compress the water inside.

Air is made of a mixture of gases, 78% nitrogen and 21% oxygen with traces of water vapor, carbon dioxide, argon, and various other components. These gasses can be compressed, but liquids such as water, cannot be compressed.

EXPERIMENTS TO TRY FOR YOURSELF: Complete these experiments at home if you have the materials OR research/find videos for these experiments.

- Balloon Rocket
- Book Blast



The inflated balloon has compressed air pressing equally against all the sides.

The air rushes out the open hole at the bottom. The action is that the air is pushed out in one direction. The reaction is that the balloon flies in the other direction.

CONGRATS,

You have completed the

Properties of Air Booklet

NEXT:

Complete these Review Questions on a separate piece of paper.

Review Questions:

What are the 6 properties of air? List and briefly explain each property.

What are some examples of each property?

Does air have mass? How do you know?

What is air pressure?

Why is it harder to breathe on top of a mountain?

What is compression?