

WHY DID THE AIRPLANE CRUSH MY BOTTLE?

An Everyday Science Mystery!

Have you ever been on an airplane with a plastic bottle full of water? You drink some water mid-flight and close the cap. The bottle, which looked perfectly normal then, looks crushed when you land. But why did this happen? The answer lies in something invisible but super powerful:



ATMOSPHERIC PRESSURE

THE INVISIBLE

BLANKET AROUND US

Our Earth is wrapped in a thick blanket of air called the **atmosphere**. Even though we can't see air, it has weight, and this weight pushes down on everything around us. This push is called **atmospheric pressure or air pressure**.

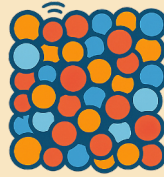
At sea level, there's a thick stack of air above you → **so air pressure is highest**.

As you go higher (like up a hill, mountain, or airplane), there's less air above → **so pressure gets lower**.

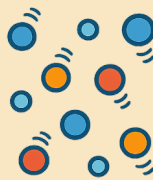
Air always pushes or tries to move from **high pressure to low pressure**, but luckily for us, it can't just escape upward forever, because gravity pulls air molecules down and keeps our atmosphere stuck to Earth.



Think of air as a crowd of tiny invisible "bouncy particles" bouncing all around us.



In places with **high pressure**, there are lots and lots of particles packed together, bumping into each other.



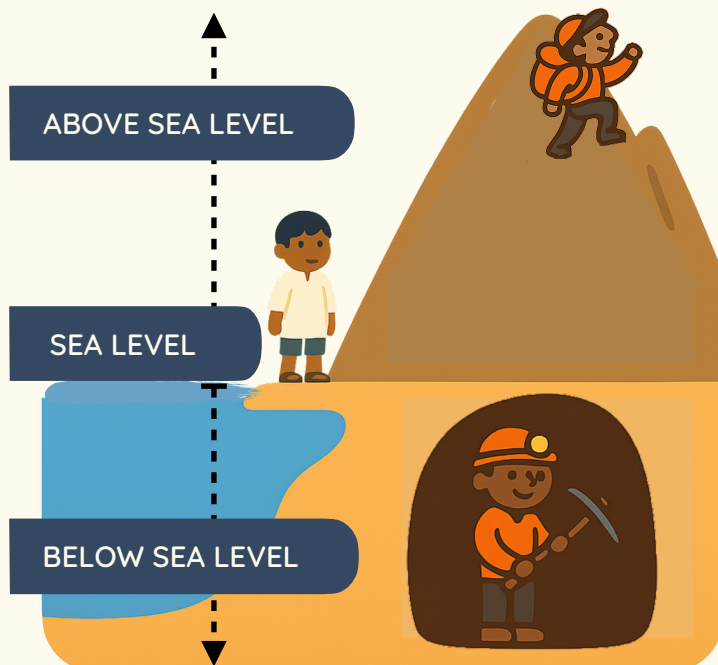
In places with **low pressure**, there are fewer air particles, so there's more space.

WHAT IS SEA LEVEL?

Sea level is simply the height of the surface of the ocean. Scientists use it as a "zero point" to measure how high or low places are on Earth.

If you climb a mountain, you are above sea level.

If you go down into a mine you can be below sea level.



THE MYSTERY OF THE CRUSHED BOTTLE!

Now, let's go back to your airplane bottle.

Up in the Sky (Low Pressure):

When the airplane climbs high, the air pressure drops. When you open the bottle to take a sip, *low pressure air fills the empty space in the bottle. When you close the cap tightly, the low pressure air is trapped inside.



*Note: High up in the sky, the air pressure is very low for us to breathe. So, airplanes pump in air and keep the cabin at a safe lower pressure, like being on top of a tall mountain. They don't make it as high as sea level because that would push too hard on the plane's walls. As the plane comes down, the cabin pressure slowly returns to normal, like it is on the ground or sea level.



Back Down to Land (High Pressure):

As the plane descends, the outside air pressure increases again. But inside your bottle, the air is still at a lower pressure. Remember, air tends to push from high pressure to low pressure. Result? The strong air pressure outside squeezes the bottle inwards, **crushing it!**



CHEW ON THIS!

WHAT HAPPENS IF YOU DRINK FROM THE BOTTLE BEFORE TAKEOFF?

Suppose you take a few sips of water while the plane is still on the ground, then screw the cap back on. What do you think will happen to the bottle once the plane is high in the sky?

You'd notice the bottle looking a little puffed out or bulgy! WHY? On the ground, when you opened the bottle to drink, the air that went inside was at high pressure. Once the plane is flying, the air outside the bottle is at lower pressure. The stronger, high-pressure air trapped inside the bottle now pushes outward against the weaker outside air - making the bottle bulge!

TRY IT!

You don't need a plane to test air pressure. Next time you go on a hike to Nandi Hills, Bengaluru (or any hill in your area), drink water on top of the hill, close the bottle and put it back in your bag. When you get back to the ground, check the shape of the bottle!