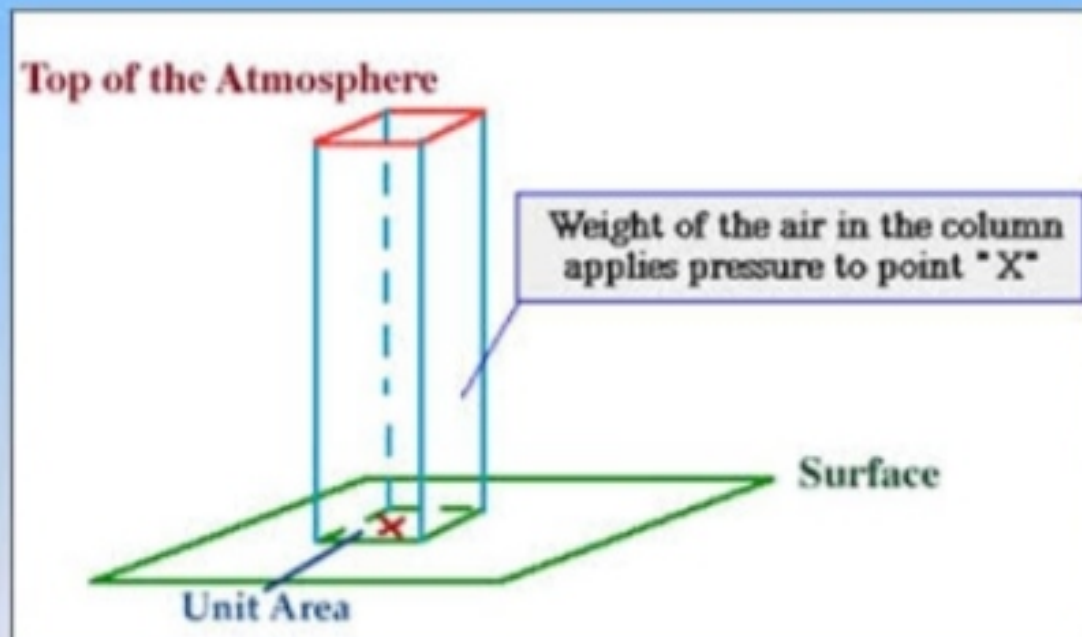


# Atmospheric pressure

# Atmospheric Pressure

Atmospheric pressure is defined as the force per unit area exerted against a surface by the weight of the air column above that surface.



The pressure at point "X" increases as the weight of the air above it increases. The pressure at point "X" decreases if the weight of the air above it decreases.

# What causes atmospheric pressure?

- The atmosphere is made up of a mixture of gases
- It is like a deep sea of air which surrounds the Earth
- The moving particles in air exert pressure in all directions

# Does the atmosphere change?



- **The atmosphere is a gas which can be squashed.**
- **The air closest to the Earth is more squashed and so is more dense**
- **At higher levels the air becomes less dense, and therefore the pressure it exerts is also reduced**

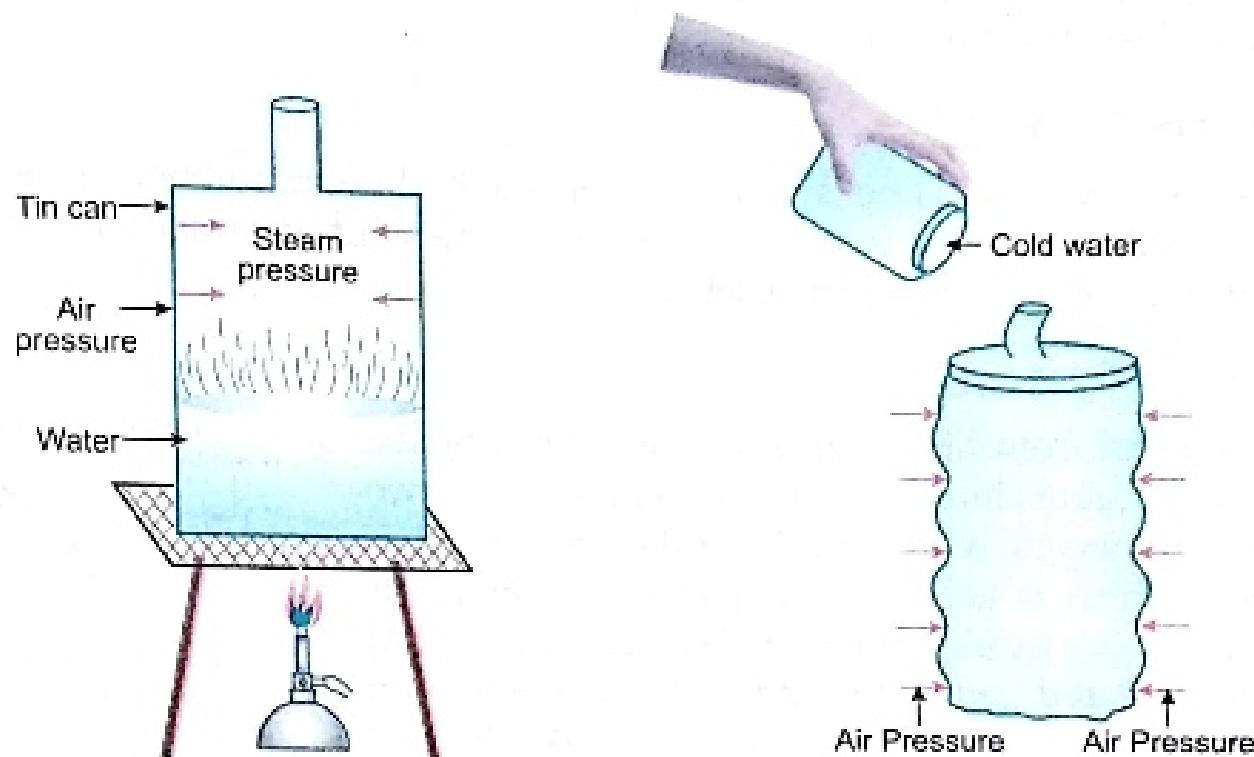
# The effects of high altitude on breathing

- Athletes train at high altitudes because of the effects on their lungs
- At lower pressures gas exchange in the lungs is not as easy as at high pressure.
- There is less oxygen so they have to breath in a greater volume of air
- Another effect is that the red blood cell count increases in order to transport the oxygen more efficiently through the body



## EXAMPLES TO DEMONSTRATE ATMOSPHERIC PRESSURE

The presence or existence of atmospheric pressure can be demonstrated in laboratory by following experiment.



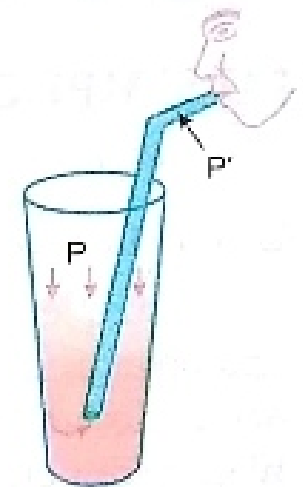
A thin tin can with an air tight stopper is filled with the some quantity of water and it is heated and when it is full of steam, air is expelled out, the stopper is than tightly replaced and simultaneously the flame (heating source) is removed cold water is then poured over the can and can collapsed inward. The reason is that initial the pressure due to steam inside the heated can is same as the air pressure outside the can but when cold water is poured, steam inside gets condensed, water is produced due to which pressure inside the can decreases and due to excess atmospheric pressure tin can collapsed inward. This experiment shown the existence of atmospheric pressure.

# COMMON CONSEQUENCES OF THE ATMOSPHERIC PRESSURE

## [A] Sucking a Juice with a Straw

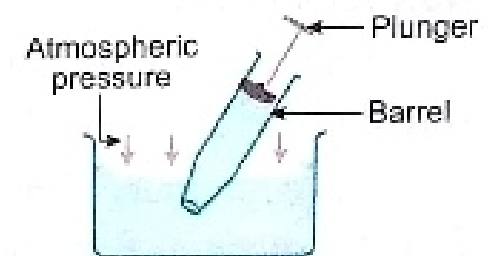
When we suck a juice with a straw, the air inside the straw goes to our lungs and air pressure in straw decreases and atmospheric pressure acting on the surface of juice or drink is more than pressure inside straw and juice is forced to reach into our mouth.

As shown in the diagram atmospheric pressure  $P$  is more than pressure  $P'$  inside the straw.



## [B] Filling a Syringe with a Liquid

When opening of syringe is kept inside a liquid and its plunger is pulled up from the barrel, the pressure inside the barrel below the plunger becomes low than atmospheric pressure acting on the liquid and liquid is forced to rise in the syringe.



## [C] Two Holes are Made in a Sealed Oil-tin

Two holes are made in sealed oil-tin in order to drain out the oil. The atmospheric pressure exerts through one hole and oil comes out from the other hole.

## [D] Nose Starts Bleeding at High Altitudes

When we go at high altitude atmospheric pressure decreases and our blood pressure becomes high as compared to atmospheric pressure and some of the blood vessels burst and bleeding takes place through nose.

### [E] Filling of Ink in a Fountain Pen

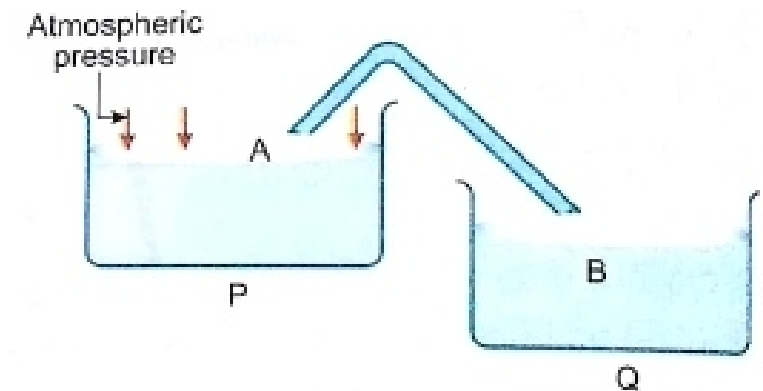
When rubber of the fountain pen is pushed by putting nib into ink, air inside the rubber tube comes out and then it is released, now pressure inside the rubber is less as compared to the atmospheric pressure and this is how ink is forced to move in pen.

### [F] Action of Rubber Sucker

Rubber suckers are often used as hooks in the kitchen and bathroom. Rubber sucker is pressed hard against the hard and smooth wall so that air inside the sucker comes out and vacuum is created. The atmospheric pressure acting on it from outside holds the sucker.

### [G] Action of Siphon System

Water can be supplied from higher level to lower level by the siphon system. Adjacent figure shows a siphon system in which two vessels *P* and *Q* are connected with a rubber tube and end *A* is immersed in vessel *P* which is kept at higher level and end *B* is above the liquid (water). Air inside tube is sucked from the end *B*, so that low pressure is created and due to atmospheric pressure on the free surface of water in vessel *P*, water is forced to tube and transferred to vessel *Q*.





## Question

- If atmospheric pressure is  $100\,000\text{ N/m}^2$ , what force is exerted on a wall with an area of  $10\text{m}^2$ ?