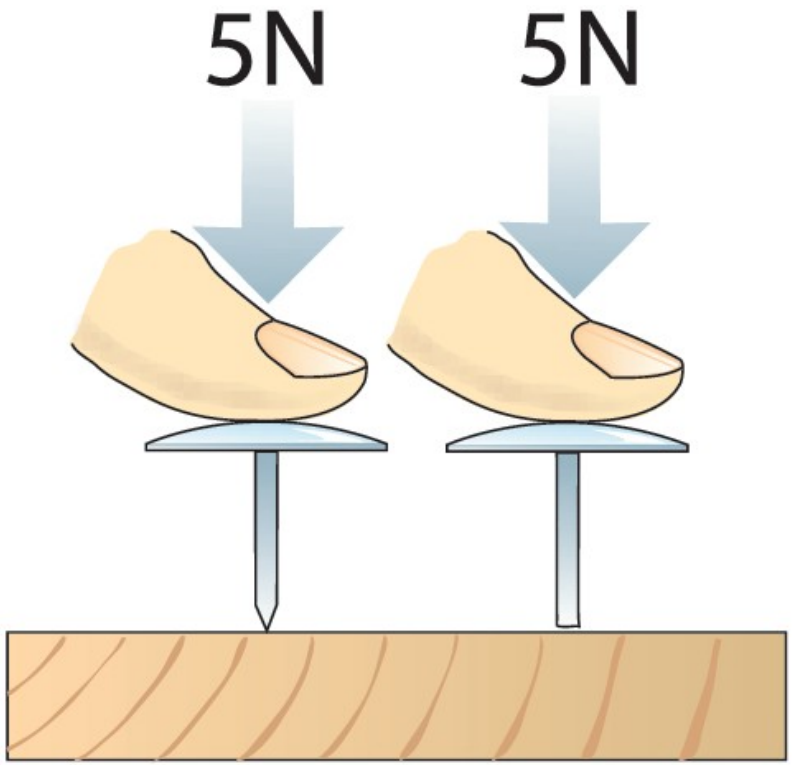
Chapter 44: Pressure

Def: Pressure is the force per unit area.

Formula: $$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$ (unit = N/m^2 or Pa)

Pa = Pascal

From this, we can see pressure is not the same as force.



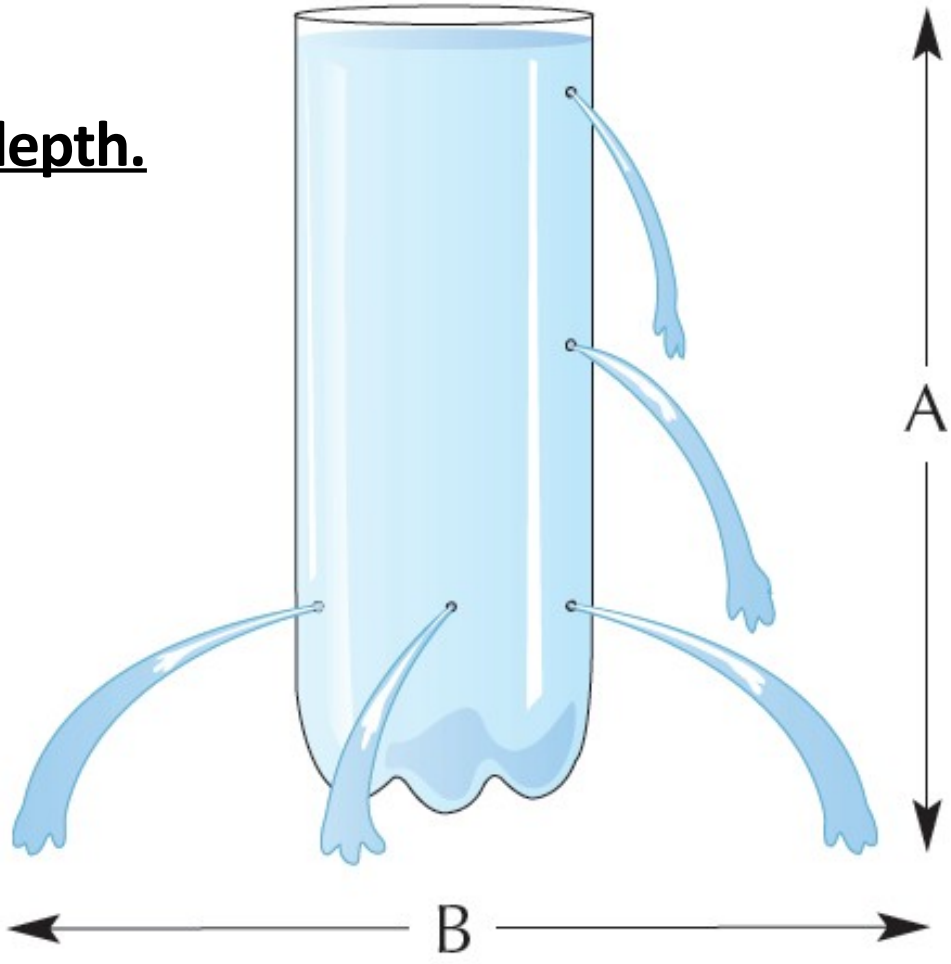
Look at the 2 nails. The nail on the left has a sharp point and exerts far more pressure than the nail on the right. This is because the area of the nail touching the wood is much smaller than the flat edge of the other nail.

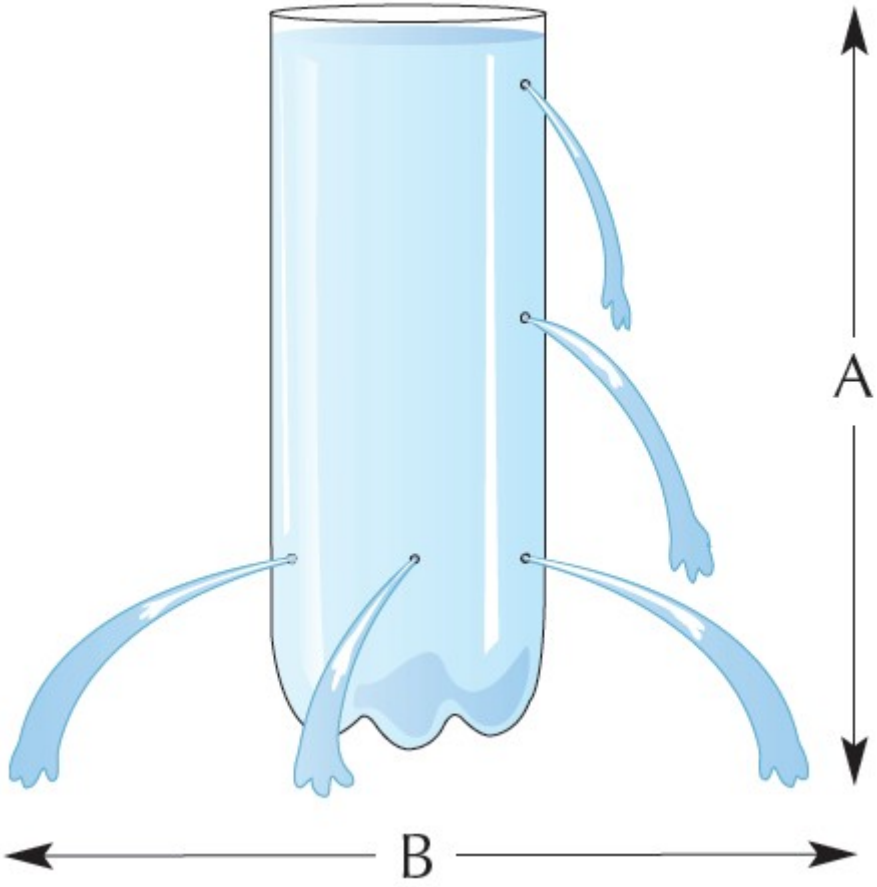
Pressure in Liquids.

The deeper we go in the sea, the more the pressure is exerted on us. In this case, we have to use a submarine which can stand these pressures. The reason for this is to do with the amount of water pushing down on us.

To show pressure increases with depth.

The bottle on the right is full of water and has several holes down one side of it. You should notice that the water will drip out the hole at the top, flow out the hole in the middle and pour out the hole at the bottom. This shows that the deeper we go, the pressure increases.





<u>To show pressure is the same in all directions.</u>

You should notice that the water will flow out at equal distances from the 3 holes at the bottom. This shows the pressure of water is the same in a directions.

Air has mass and occupies space.

It may not be obvious but air has mass and takes up space.

Find the mass of an empty balloon. Then blow it up and find the mass. There will be a slight difference. Also, it can be seen that balloon full of air takes up space.

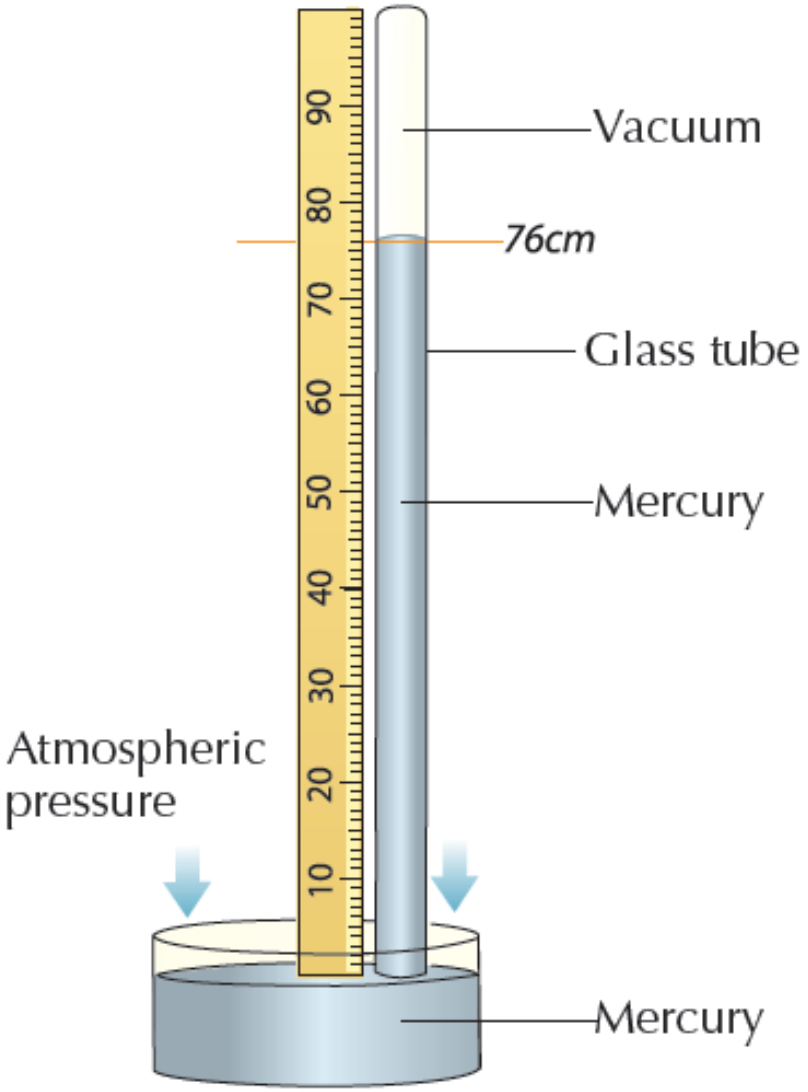
Atmospheric Pressure.

This is the pressure exerted on the earth by the air above us. The atmosphere is approximately 15 km thick and the pressure at sea level is different to the pressure at the top of a large mountain.

The air exerts 10 tonnes on every 1 metre square of ground. However we don't notice this because the pressure pushes equally in all directions (inside and outside of us).

Measuring Atmospheric Pressure.

A barometer is used to measure atmospheric pressure.



The Mercury Barometer.

The diagram shows a mercury barometer. The tube is filled with mercury and inverted in a bowl. The mercury falls leaving a vacuum at the top.

As the atmospheric pressure pushing down changes, the height of the mercury changes.

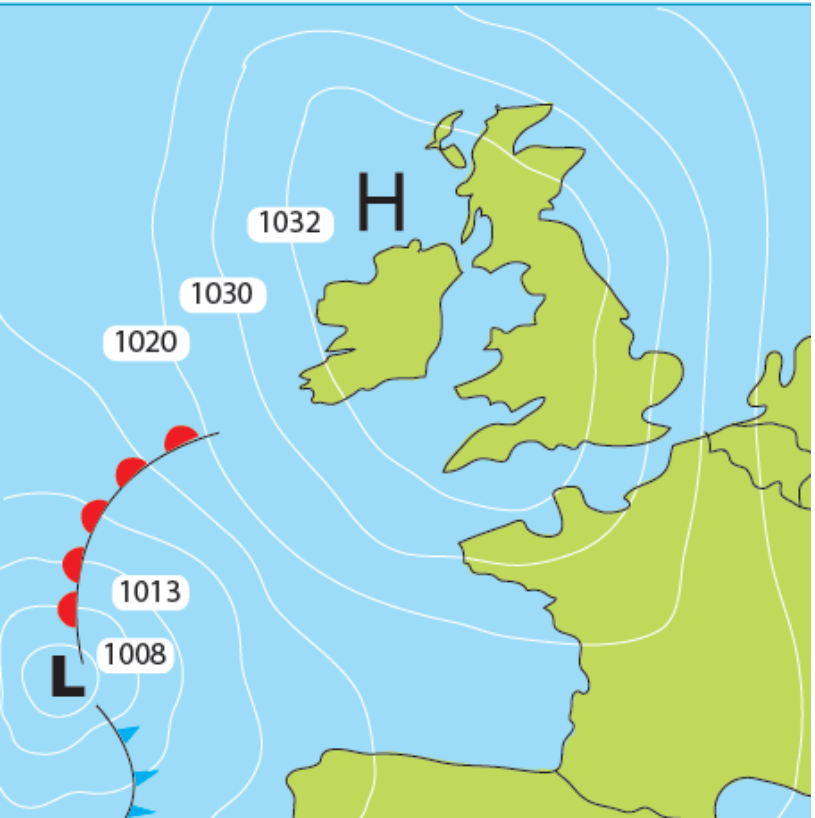
Normal atmospheric pressure is 76cm.

Measuring Altitude.

An altimeter is used to measure altitude.

As a plane or helicopter goes higher, the height of the atmosphere overhead gets less, therefore the atmospheric pressure gets less. A barometer in the plane measures this and translates this into height above sea level.

Atmospheric Pressure and the Weather.



Atmospheric pressure has a huge effect on the weather. High pressure means sunny weather where low pressure gives rain and cloudy sky's.

Weather charts have lines called isobars showing equal pressures in different areas. The numbers are in hectopascals, where the normal is 1013 hectopascals.