# KS3 Phys: Pressure

**Keywords/ Definitions**

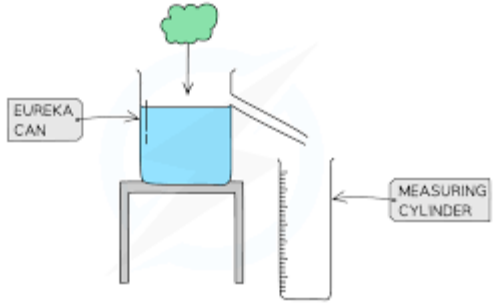
| Keyword | Meaning |
|---|---|
| Atmosphere | The layers of gases that surround the Earth. The important gases in the atmosphere are nitrogen, oxygen and carbon dioxide. |
| Atmospheric pressure | The weight of air resting on the Earth's surface. |
| Fluid | A substance that can flow, such as a liquid or a gas. |
| Normal | Acting at an angle of 90° to a surface or boundary |
| Pascal | Unit of pressure. Pascal (Pa), eg normal atmospheric pressure is 1.01x105 Pa. |
| Pressure | Force exerted over an area. The greater the pressure, the greater the force exerted over the same area. |
| Surface area | The total area of an object, for example the area of a skydiver's body facing the air as they fall, or the area of a car tyre that touches the road. |
| Upthrust | Upwards force exerted by a liquid or gas on an object floating in it. |
| Density | A measure of compactness and the ratio of mass to volume. It is usually measured in kilograms per metre cubed (kg/m$^3$) or grams per centimetre cubed (g/cm$^3$). |

**Key Facts**

- Liquids and gases are fluids.
- A **fluid** is able to change shape and flow from place to place.
- Fluids exert pressure on surfaces, and this pressure acts at 90° to those surfaces – we say that it acts **normal** to the surface.
- The **atmosphere** exerts a pressure on you, and everything around you.
- Atmospheric pressure changes with altitude. The higher you go the lower the atmospheric pressure.
- The pressure in liquids changes with depth. The deeper you go the greater the liquid pressure.
- For a floating object, the upthrust is equal and opposite to the object's weight.
- An object will continue to sink if its weight is greater than the maximum upthrust.

To calculate density:

- The mass is measured using a balance. The volume of a liquid is measured using a measuring cylinder. The volume of a regular solid can be measured by l x w x h
- The volume of an irregular object - use a displacement can (also called a eureka can) – the sample is lowered into a container of water and the volume of water it displaces or pushes out of the way is the same as the volume of the object




**Numeracy**

**Calculating pressure**

To calculate pressure, you need to know two things:

1. the force or weight exerted
2. the **surface area** over which the force or weight is spread

Pressure is calculated using this equation:

**Pressure = force/area**

**Example**

A force of 20 N acts over an area of 4 m$^2$. Calculate the pressure.

pressure = force ÷ area

= 20 N ÷ 4 m$^2$ = 5 N/m$^2$

Notice that the unit of pressure here is N/m$^2$ (newtons per square metre).

Sometimes you will see another unit being used. This is called the **pascal** and it has the symbol Pa.

1 Pa = 1 N/m$^2$, so in the example above the pressure is 5 Pa.

The density of an object or substance is its mass divided by its volume: **Density = Mass ÷ Volume**.

The units of density depend on the units used for mass and volume, but are usually: **g/cm$^3$** (if mass is measured in g and volume in cm$^3$).