

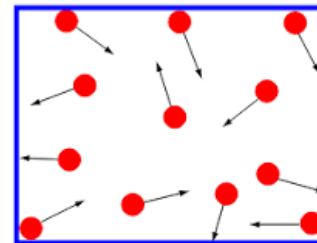
Box 1: Keywords

Word	Definition
Density	The mass per unit volume of an object usually measured in g/cm^3 or kg/m^3
Kinetic energy	The store of energy found in moving objects
Particle	A small piece of matter, from which everything is made
Particle model	A model to show the arrangement and behaviour of particles in the three states of matter
Pressure	The force acting perpendicular to a surface, per unit area N/cm^2 or N/m^2 . One N/m^2 = One Pascal (Pa)
State of matter	One of the three physical states of a substance: solid (s) , liquid (l) or gas (g)
Temperature	A measure of how hot something is, determined by the average kinetic energy of its particles. Measured in $^{\circ}\text{C}$
Volume	The amount of space that a substance occupies, measured in cm^3 or m^3

Box 2: Key skills

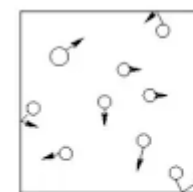
Using models to explain phenomena; graph skills; equation use and manipulation; carry out practical work safely and accurately.

Box 3: Pressure in gases

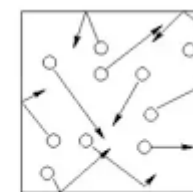


The **particles** in a gas are always moving in all directions. Gas **pressure** is a result of the **force** of the gas particles hitting the walls of the container

Box 4: Temperature and Pressure in gases



Cool gas, fewer and less energetic collisions

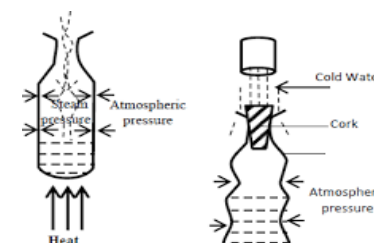


Hot gas, more and more energetic collision

Increasing the **temperature** of a gas gives the **particles** more **kinetic energy** so they hit the sides of the container with more **force** so the **pressure** in a sealed container will increase

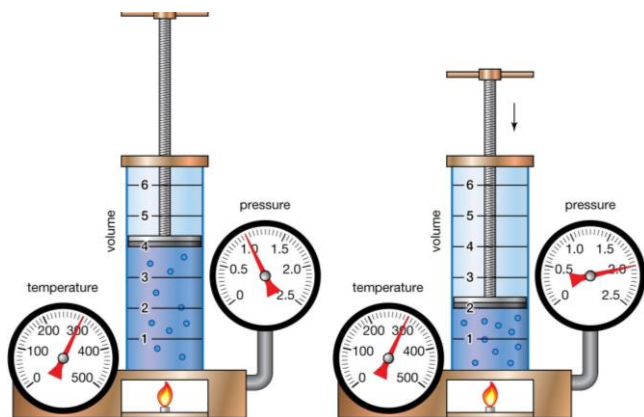
Box 5 The collapsing can experiment

When you heat the can you cause the water in it to boil. The **vapour** from the boiling water pushes air out of the can and the can fills with water vapour.



Cooling the can causes the water vapour in the can to **condense**, creating a **partial vacuum**. The extremely low pressure of the partial vacuum inside the can makes it possible for the **pressure** of the air outside the can to crush it.

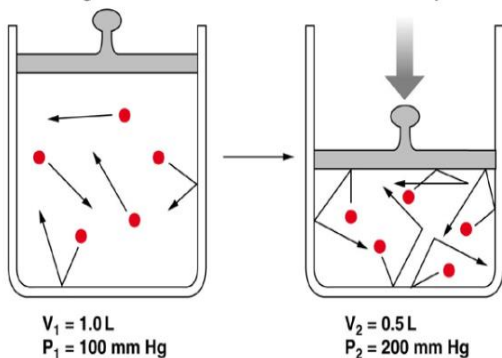
Box 6: Volume and Pressure in gases



If the **volume** of a gas at a **constant temperature** is decreased the **pressure** will increase. This is because the number of **particles** per unit volume (the density) increases so there are more frequent particle **collisions** with the walls of the container, so more **force** is exerted on the walls. More force equals more pressure.

Boyle's Law: $P_1 V_1 = P_2 V_2$

Decreasing volume increases collisions and increases pressure.

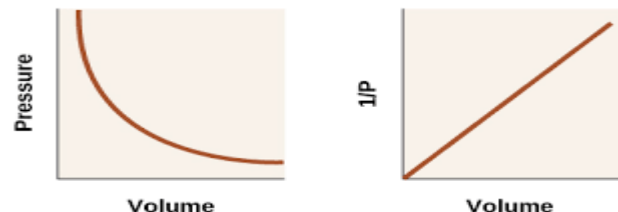


Boyle's Law in action!

A packet of crisps will **expand** in an aeroplane because the cabin **pressure** decreases so the **volume** of (nitrogen) gas inside the crisp packet increases!



Box 7: Boyle's Law



$$P_1 V_1 = P_2 V_2$$

When temperature is constant, this equation is used to compare different conditions on the same solution

$$P \propto \frac{1}{V}$$

Pressure is inversely related to volume

$$PV = k$$

Pressure multiplied by volume equals the k constant
(k = proportionality constant)

Remember!

Pressure is inversely proportional to the volume of a gas

P = Pressure
V = Volume

Box 8: Pathway

Previous knowledge:

KS3: States of matter; Pressure; Density of materials

Future links:

Careers:

Materials scientists and engineers; sparkling drinks manufacturers; gas heating engineers; hot air balloonists

Box 9: Cross curricular links