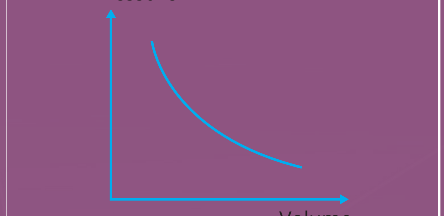
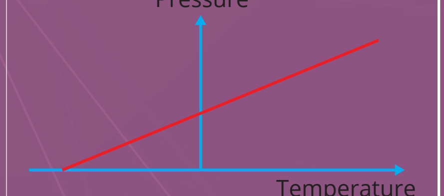
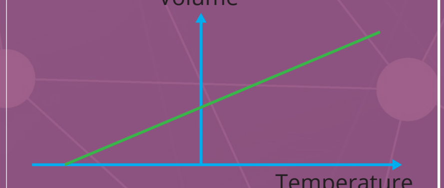
Gases contain particles that are free to move around. This means that they collide with the surface of any container and through colliding exert a force on that surface, the more frequent the collisions the greater the force.

Describing the relationships between properties and behaviour of gases

Factors	Relationship	Relationship
Pressure and Volume (Fixed temperature) 	When you **decrease** the volume of a gas the pressure will **increase**. (Inversely proportional)	Particles having less room to move around and therefore colliding with the surface of the container more often.
Pressure and temperature (Fixed volume) 	When you **increase** the temperature on a fixed volume of gas, the pressure will **increase**. (Directly proportional)	Particles move around more quickly and collide with the surface of the container more often.
Volume and temperature (Fixed pressure) 	When you **increase** the temperature of a gas, the volume will **increase** if the pressure remains constant. (Directly proportional)	Particles move around more quickly and collide with each other more often forcing the particles further apart.

Absolute zero
Notice that the graphs of Pressure against Temperature and Volume against Temperature **don't reach zero** at 0°C. They **reach 0 at a temperature of -273°C,** this temperature is known as absolute zero.

Pressure can be calculated using the following equation:

$$Pressure = \frac{Force}{Area}$$

It represents how much force is put onto a specific area and is normally given in units of Pascals (Pa) where **1Pa = 1 N/m²**. This equation can be used to calculate the pressure by a solid on another solid or the force of a gas on a surface.

Kelvin
As absolute zero is not 0°C, a new scale where absolute zero was at zero was introduced. On this scale 0K = -273°C and therefore 0°C = 273K.

$$T/K = \theta/°C + 273$$

These relationships allow us to use the following equation to calculate the changes in pressure, temperature or volume.

$$\frac{pV}{T} = constant$$

Where p = pressure, V = volume and T = temperature in Kelvin.

This allows us to calculate the new pressure, volume and temperature if there is a change to the gas because the constant is the same for that gas.

For example, if bottle contains 5.0×10^{-4}m³ of air at 290K, the pressure inside the bottle is 100000Pa. When the bottle is moved the volume changes to 3.8×10^{-4}m³ and the temperature remains the same. The new pressure inside the bottle could be calculated using the equation:

At the start:

$$\frac{pV}{T} = \frac{100\,000 \times 5.0\times10^{-4}}{290} = constant = 0.17$$

The constant (0.17) must be the same after the volume changed:

$$\frac{pV}{T} = \frac{p \times 3.8\times10^{-4}}{290} = 0.17$$

The same constant

Rearranging this equation gives:

$$p = \frac{0.17 \times 290}{3.8\times10^{-4}} = 130\,000Pa$$