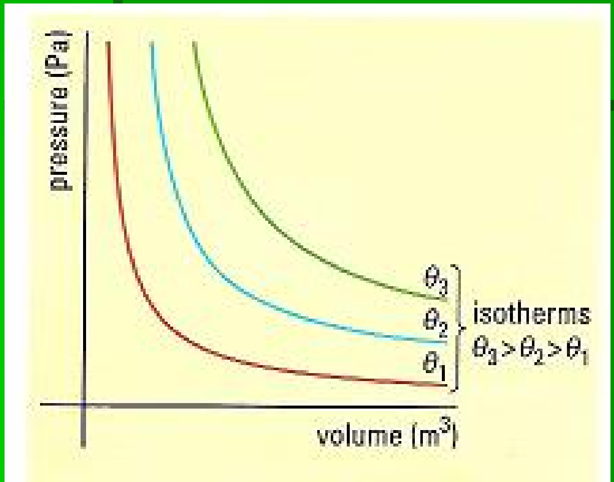
Ideal gas behaviour

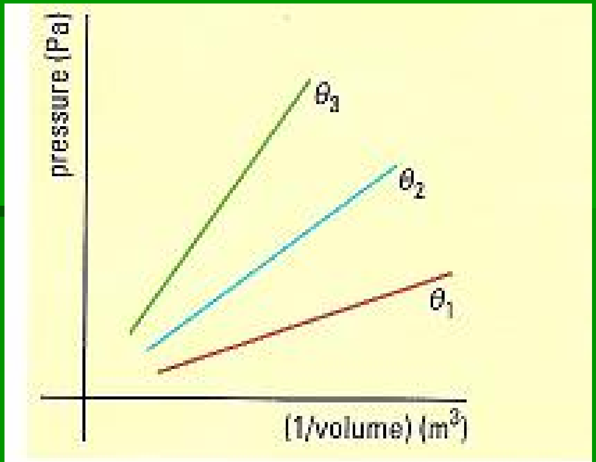
•All gases will behave ideally under the right conditions

•Boyle´s law:

In 1662 Robert Boyle discovered that the pressure and volume of gas are related to each other in a manner that does not depend on the nature of the gas. If the temperature is kept constant then

$$P = 1/V \text{ or } PV = \text{constant at constant temperature}$$





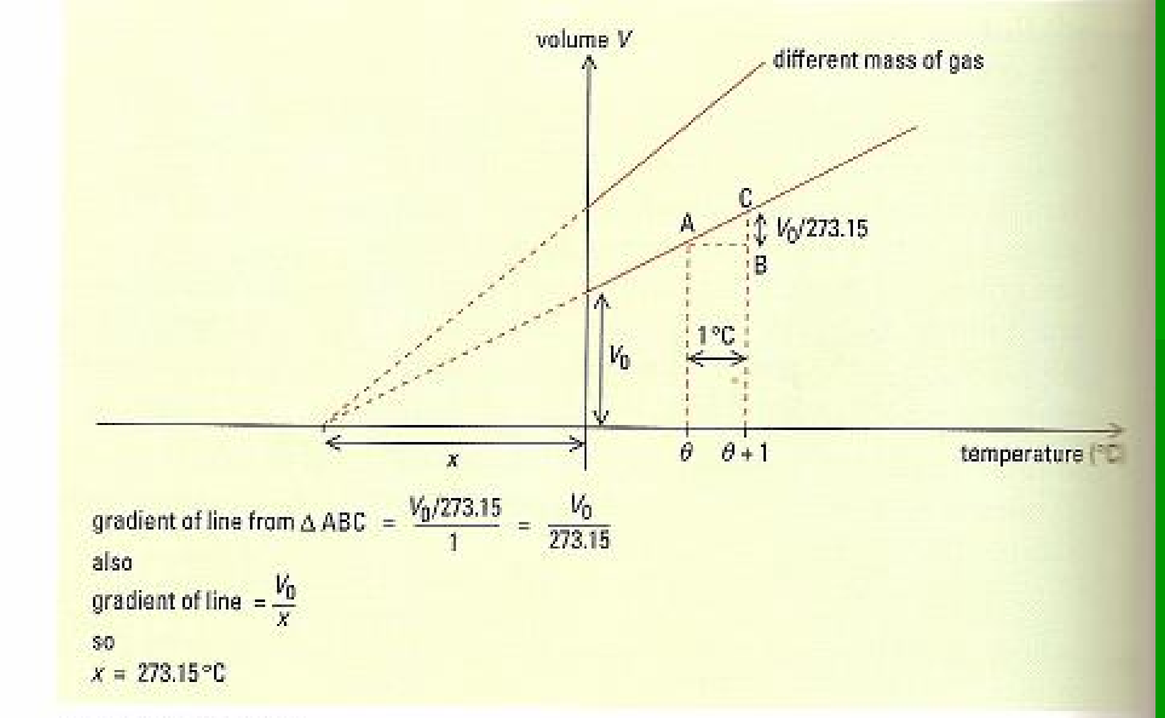
Plotting p against 1/V will give a straight line, showing that Boyle's law is being obeyed.

Charle´s law:

•In 1787 the French physicist Jacques Charles experimented with different gases, keeping their pressure constant and altering their temperature.

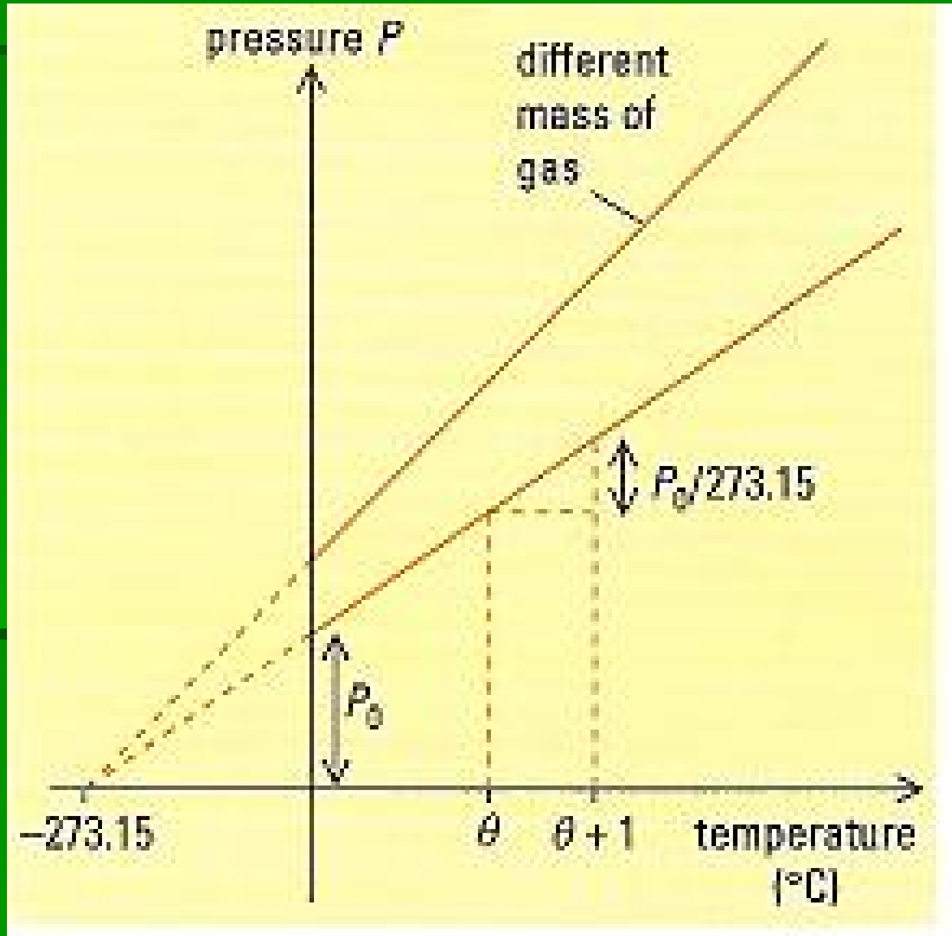
•As the temperature is increased, every gas expands in proportion to the temperature increase.

$V = V_0\ (1 + t\ /\ 273.15)$



Using Charles's law.

- For every degree rise in temperature the pressure of the gas increases by 1/273.15 of its pressure at 0°C.
- $p = p_0 (1 + t / 273.15)$
- **pV/T (K)=constant**



The pressure law.

2 The pressure of air in a car tyre is 1.90×10^5 Pa at 18 °C. Assuming that the volume of the tyre is constant:

a What will the pressure of the tyre be at 25 °C?

b By how much does the pressure of the tyre increase for every °C rise in temperature?

3 A gas occupies a volume of 6.0×10^{-3} m^3 and exerts a pressure of 80 kPa at a temperature of 20 °C. What pressure does it exert if, separately

i the temperature is raised to 40 °C;

ii the volume is halved;

iii the volume is changed to 7.7×10^{-3} m^3 and the temperature becomes 57 °C.