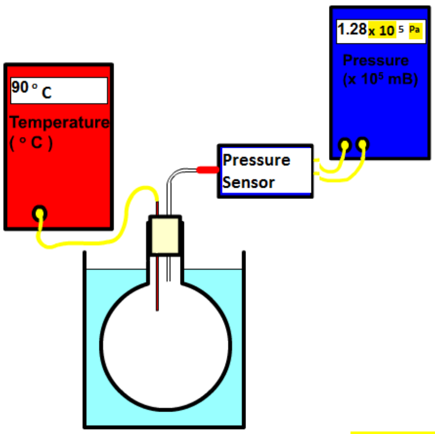
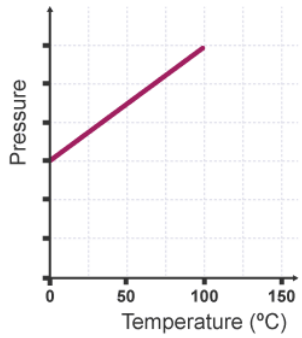
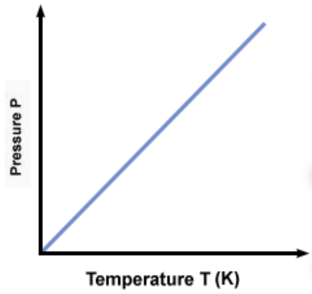
GAS LAWS SUMMARY

1. Pressure and Temperature

(**Volume constant, mass constant)







** TEMP MUST BE IN KELVIN

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

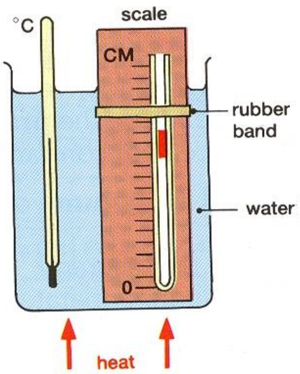
Kinetic theory

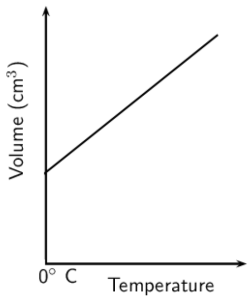
- Temp ↑ particles have greater speed, and greater Ek

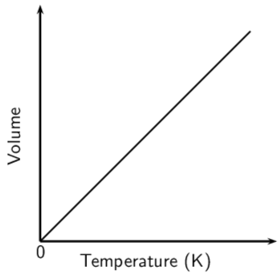
- Particles collide with container walls more often and with greater Force, - since P = F/A, Pressure ↑

2. Volume and Temperature

(**Pressure constant, mass constant)







** TEMP MUST BE IN KELVIN

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

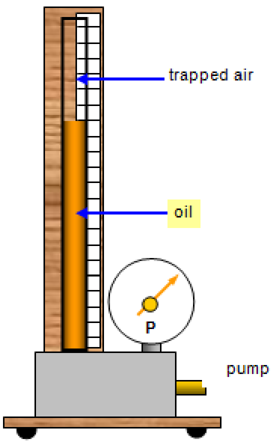
Kinetic theory

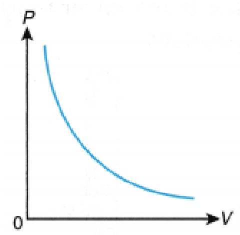
- Volume ↓ particles collide with container walls more often-

Overall force increases, - since P = F/A, Pressure ↑

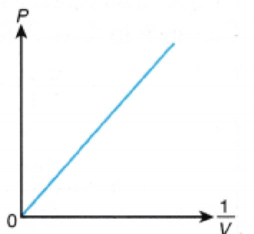
3. Pressure and Volume

(**Temperature constant, mass constant)





(a) Graph of P against V



(b) Graph of P against $\frac{1}{V}$

$$p_1V_1 = p_2V_2$$

Kinetic theory

- Volume ↓ particles collide with container walls more often

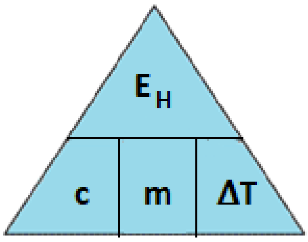
- Overall force increases - since P = F/A, Pressure ↑

Pressure is the force per unit area	Combined Gas Equation	Degrees Celsius to Kelvin: + 273
$p = \frac{F}{A}$	$\frac{pV}{T} = constant$	Kelvin to degrees Celsius: - 273
p : (Pa or Nm^{-2}) F : (N) A : (m^2)	$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	Absolute Zero: -273 °C / 0 K There is no negatives on the kelvin scale Temperature is a measure of the mean kinetic energy of particles

Specific heat capacity (c): Heat energy required to raise the temperature of 1kg of a substance by 1°C

$E_H = c\ m\ \Delta T$

E_H : Heat energy (J)
c : specific heat capacity (J kg^{-1} °C^{-1})
m : mass (kg)
ΔT : change in Temperature (°C)



Specific heat capacity values are different for all materials
- values found in data sheet

$E = P\,t$ can be used to find heat energy supplied by appliances

Heat energy will usually be lost to the surroundings - not all will be transferred to the substance being heated

Low specific heat capacity -
not much energy to heat (heats up quickly for constant power) but loses heat quickly
High specific heat capacity -
lots of energy to heat (heats up slowly for constant power) but loses heat slowly (retains heat better)

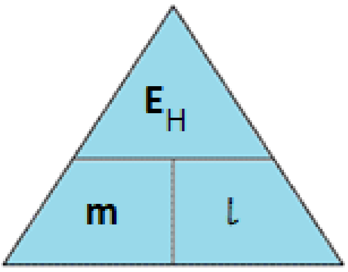
Specific latent heat (l): Heat energy required to change the state of 1kg of a substance at the same temperature

Specific latent heat values are different for all materials – values found in data sheet

$E_H = m\ l$

E_H : heat energy (J)

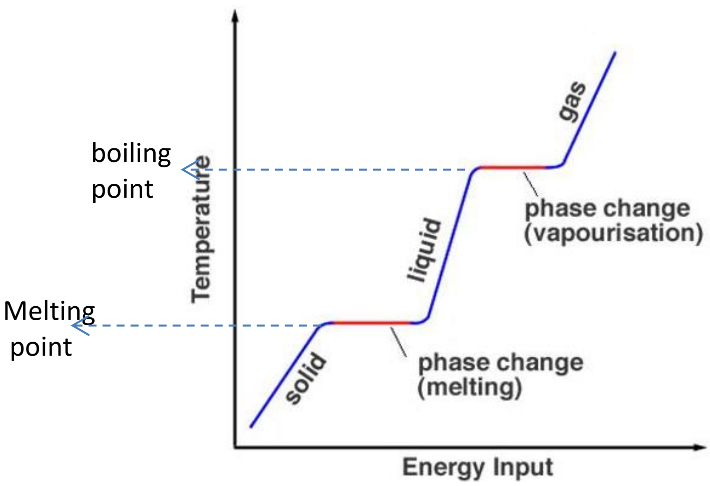
m : mass (kg)



Specific Latent heat of fusion, l_f :
Solid -> Liquid
Specific Latent heat of vaporisation l_v :
Liquid -> Gas

l : specific latent heat of fusion / vaporisation

The same material **requires different quantities of heat** to change the state of unit mass from **solid to liquid (fusion)** and to change the state of unit mass from **liquid to gas (vaporisation).**



During change of state
– **temperature remains constant**

For change of temperature:

$E_H = c\ m\ \Delta T$

For change of state:

$E_H = m\ l$

"specific" = per kilogram