

Key Definitions

Internal energy	The total kinetic and potential energy of all of the particles that make up the system.
Specific heat capacity	The amount of energy needed to increase the temperature of 1 kg of a substance by 1°C.
Specific latent heat	The energy needed to change the state of 1 kg of a substance with no change in temperature.
Specific latent heat of fusion	The energy needed to change 1 kg of liquid to gas at constant temperature.
Specific latent heat of vaporisation	The energy needed to change 1 kg of solid to liquid at constant temperature.

Key Equations

Equations to learn

Density = mass/volume

$$\rho = m/V$$

M = Mass (Kg)

ρ = Density (Kg/m³)

V = Volume (m³)

Equations given to you

Energy transferred = mass x specific latent heat

$$E = m \times L$$

E = Energy (Joules)

M = Mass (Kg)

L = Specific Latent Heat (J/Kg)

Energy Transferred = mass x specific heat capacity x change in temp'

$$E = m \times c \times \Delta T$$

m = Mass (Kg)

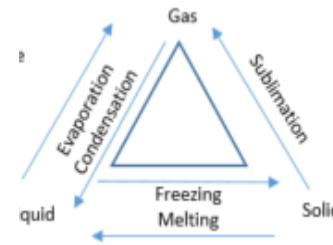
C = Specific Heat Capacity (J/Kg°C)

Δt = change in Temperature (°C)

Key Information

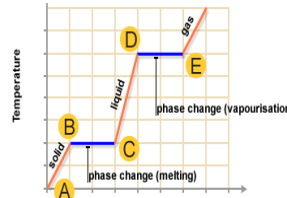
Change of State

- Energy – Increase or Decrease
- Movement – particles move more or less
- Bonds – Broken or made
- State
- Process



Specific Latent Heat

The amount of energy required to change the state without changing the temperature.



As you increase the energy, you increase the temperature. When the temperature stays constant, you have change of state. The energy is being used to break the bonds.

Specific latent heat of fusion
Specific latent heat of vaporisation

Key Practical

Required Practical – Density

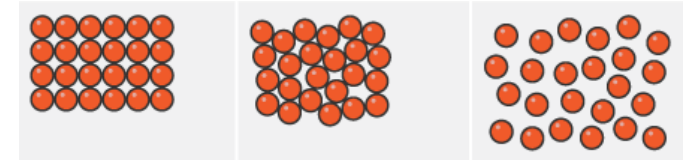
1. Regular Shaped Solid – Measure the length, width and height to find volume then weight it to find mass
2. Irregular Shaped Solid – Use a displacement can to find the volume (1ml = 1cm³) then find mass.
3. Liquid – Find volume (1ml = 1cm³) then pour into a beaker on a scale to find mass.

NB

- Make sure you zero the scale or weigh the beaker
- The smaller the scale on the measuring cylinder the more precise it is.

Key Information

Particle Model



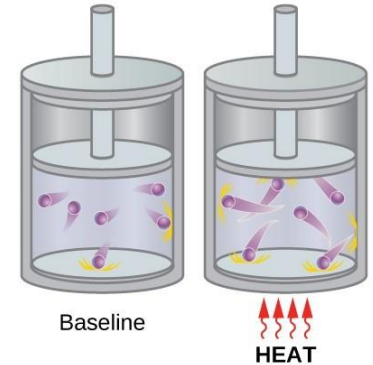
	Solid	Liquid	Gas
Movement of Particles	Vibrate around a fixed position	Fluid movement – slide over each other	Random motion Different speeds in different directions
Arrangement of Particles	Regular, all touching in rows.	Free flowing but touching	Random not touching

Key information

Particle motion in Gases

Molecules in a gas constantly move randomly. The temperature of a gas is related to the average kinetic energy of the molecules.

Increasing the temperature of a gas at a constant volume increases the velocity of the particles and the pressure exerted by the gas.



Temperature increased
Volume constant
= Increased pressure



Key Equations

Pressure x volume = constant (for a fixed volume of gas)

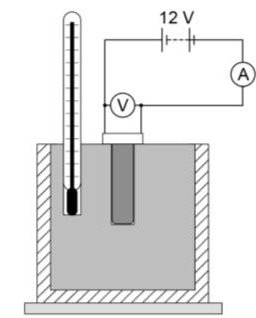
- $P \times V = k$
- P = pressure (Pa or N/m^2)
- V = volume (m^3)
- k = constant for that mass of gas (Nm)

Key Practical

Required Practical: Specific Heat Capacity

The increase in temperature of a system depends on three things:

- The mass of the substance
- The energy input to the system
- The type of material



Different substances require more energy than others to heat them up. The amount of energy required to heat up different substances can be compared by calculating the specific heat capacity.

A circuit is set up connecting to a small heater. The heater is placed into a 1kg block of the material being tested and switched on. The current and potential difference are recorded so that Power can be calculated (Power = IV)

A thermometer is used to measure the increase in temperature every minute.

Work done each minute is calculated (Work Done = Power x time)

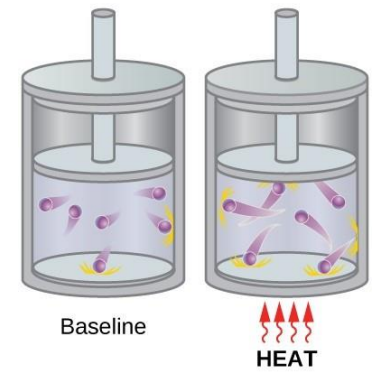
A graph is plotted and the formula $1/\text{gradient}$ is used to calculate the heat capacity of the block. This is the amount of heat energy used to increase the temperature by $1^\circ C$.

All of the data gathered can be used to calculate the specific heat capacity.

Key information

Pressure in Gases

Gas Pressure is caused by the force exerted when particles collide with the walls of the container.



Increasing the temperature of a gas at a constant volume increases the pressure exerted by the gas. This is because the particles gain kinetic energy and there are, therefore, more collisions with the container walls.

Temperature increased
Volume constant
= Increased pressure

Changing the volume of the container changes the time between collisions and, therefore, the pressure.

Doing work on the gas, such as with a bike pump, can cause the temperature of the gas to increase.