AQA GCSE Physics

Paper 1 (H) Revision

Topic 3: Particle Model

Name: ___________________________________

Form: 11 ___

AQA GCSE Physics
Paper 1 Revision
Topic 3: Particle Model

Specification point	Notes ✓	☺		☹	Questions?
The equation for the density of a material ρ = m/V					
The particle model can be used to explain the different states of matter.					
The differences in density between the different states of matter to be explained in terms of the arrangements of the particles (atoms or molecules).					
When substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved.					
Changes of state are physical changes; the change does not produce a new substance. If the change is reversed the substance recovers its original properties.					
Energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy.					
Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.					
Heating changes the energy stored within the system by increasing the energy of the particles that make up the system. And, either the temperature of the system increases, or changes of state happen.					
If the temperature of the system increases: the increase in temperature depends on the mass of the substance heated, what the substance is and the energy input to the system.					
The equation for specific heat capacity E = mcΘ					
The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.					
The energy needed for a substance to change state is called latent heat. When a change of state occurs, the energy supplied changes the energy stored (internal energy), but not the temperature.					
The specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance with no change in temperature:					
The equation for specific latent heat E = mL					
Specific latent heat of fusion – change of state from solid to liquid.					
Specific latent heat of vaporisation – change of state from liquid to vapour.					

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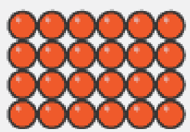
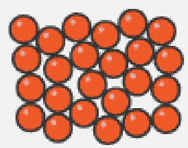
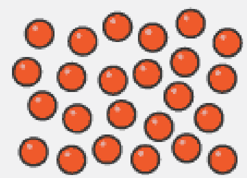
The molecules of a gas are in constant random motion. The temperature of the gas is related to the average kinetic energy of the molecules. The higher the temperature, the greater the average kinetic energy and so the faster the average speed of the molecules.					
When the molecules collide with the wall of their container they exert a force on the wall. The total force exerted by all of the molecules inside the container on a unit area of the walls is the gas pressure.					
Changing the temperature of a gas, held at constant volume, changes the pressure exerted by the gas (known as the Pressure law).					
A gas can be compressed or expanded by pressure changes. The pressure produces a net force at right angles to the wall of the gas container (or any surface).					
Increasing the volume in which a gas is contained, at constant temperature, can lead to a decrease in pressure (known as Boyle's law).					
The Boyle's law equation PV = constant.					
Work is the transfer of energy by a force.					
Doing work on a gas increases the internal energy of the gas and can cause an increase in the temperature of the gas.					

States of Matter

Kinetic Theory

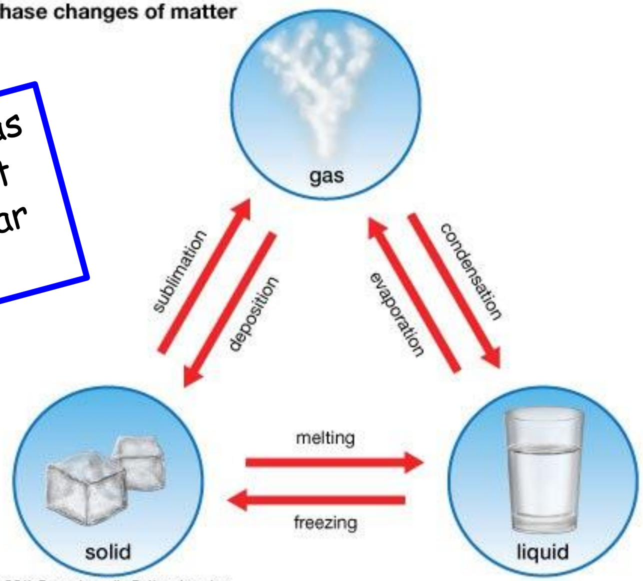
	Solid	Liquid	Gas
Arrangement of particles	Close together Regular pattern	Close together Random arrangement	Far apart Random arrangement
Movement of particles	Vibrate on the spot	Move around each other	Move quickly in all directions
Diagram			

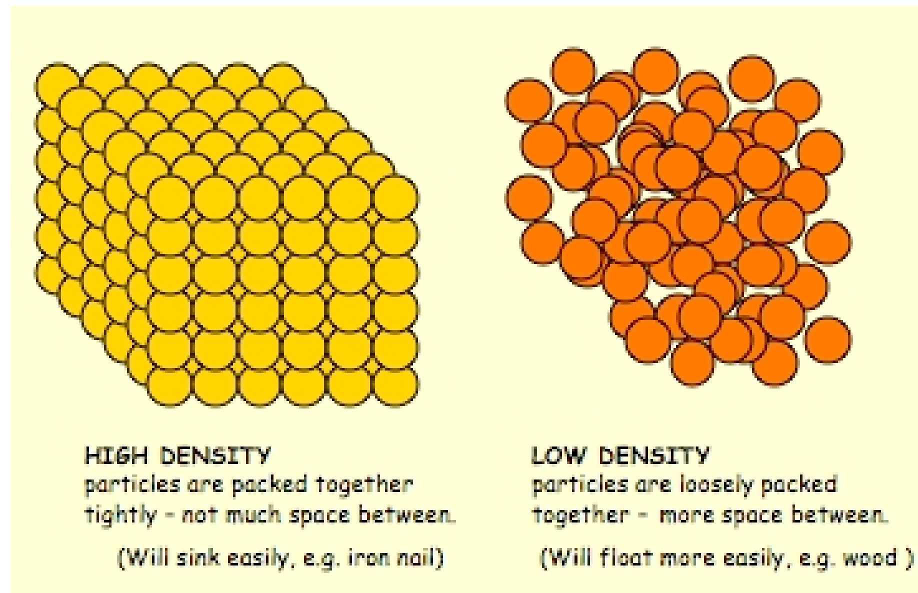
$$\rho = \frac{m}{V}$$

density (ρ), mass (m), volume (V)

Which state has the strongest intermolecular forces?

Phase changes of matter





SHC & Latent heat

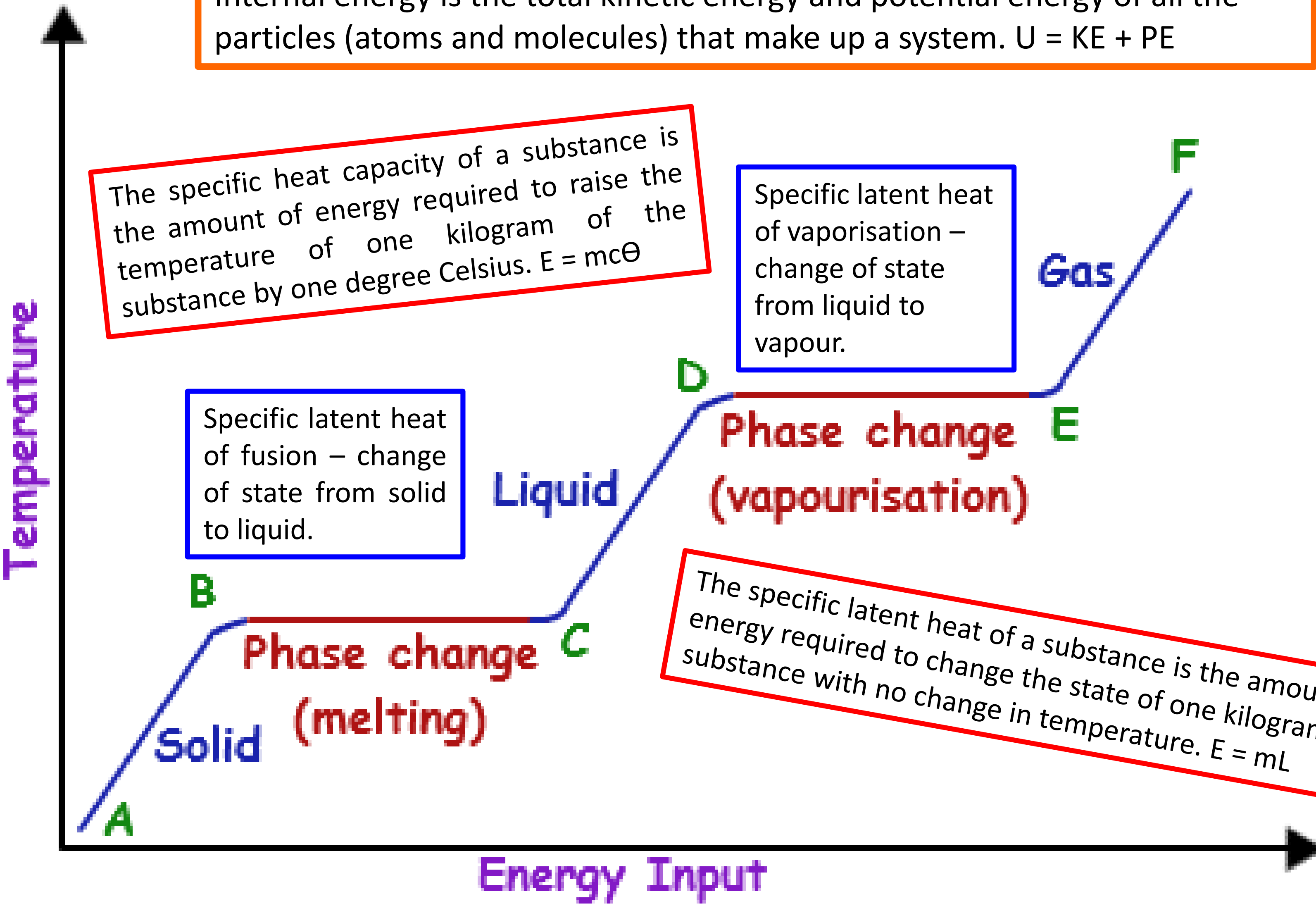
Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system. U = KE + PE

The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius. E = mcΘ

Specific latent heat of vaporisation – change of state from liquid to vapour.

Specific latent heat of fusion – change of state from solid to liquid.

The specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance with no change in temperature. E = mL

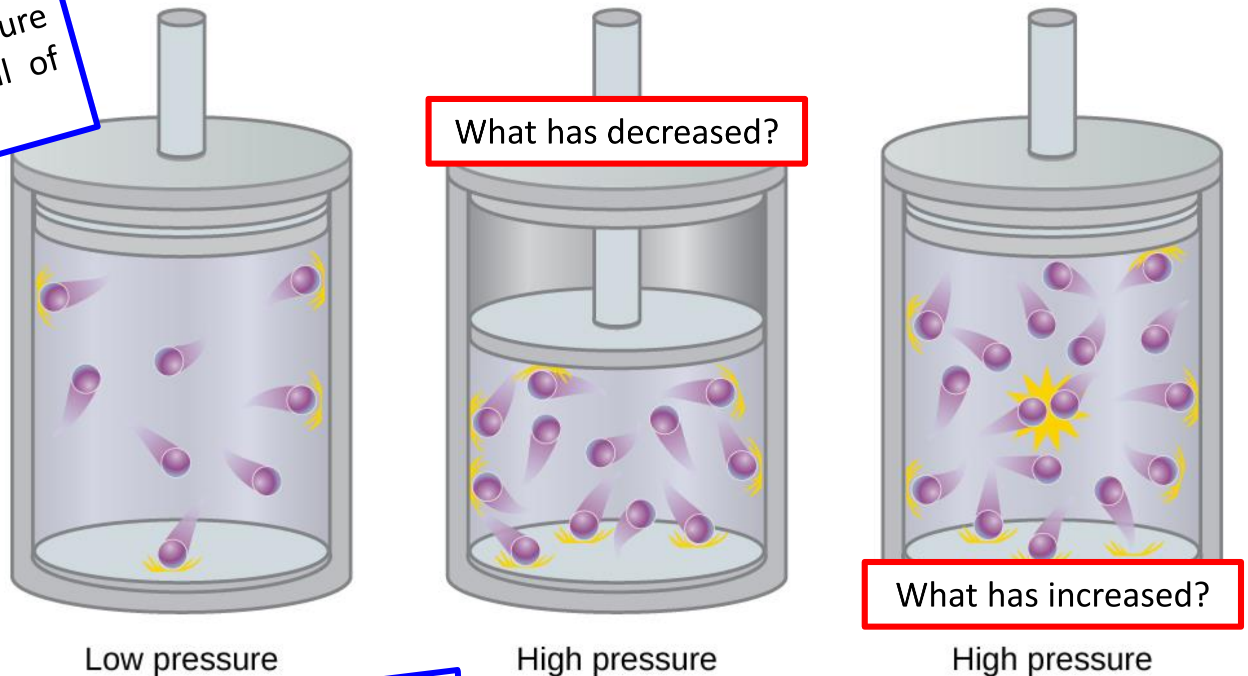


Gas Pressure

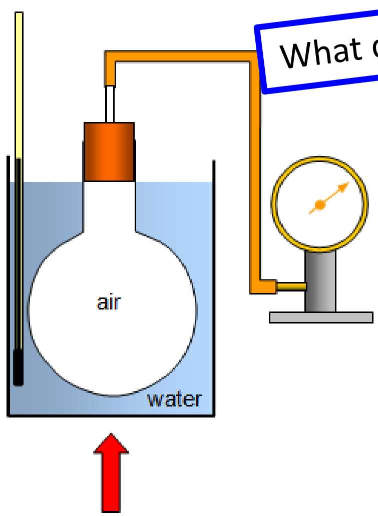
What causes pressure in a container full of gas?

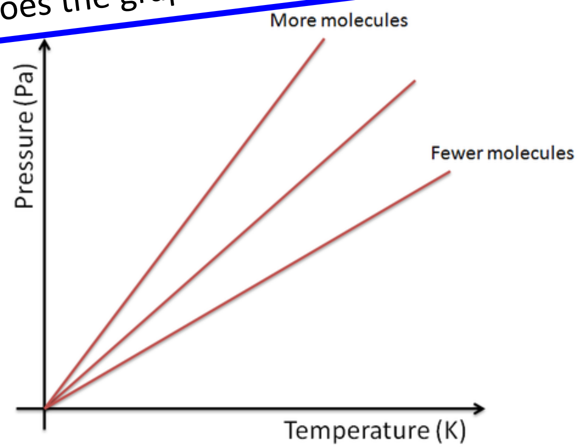
What has decreased?

What has increased?

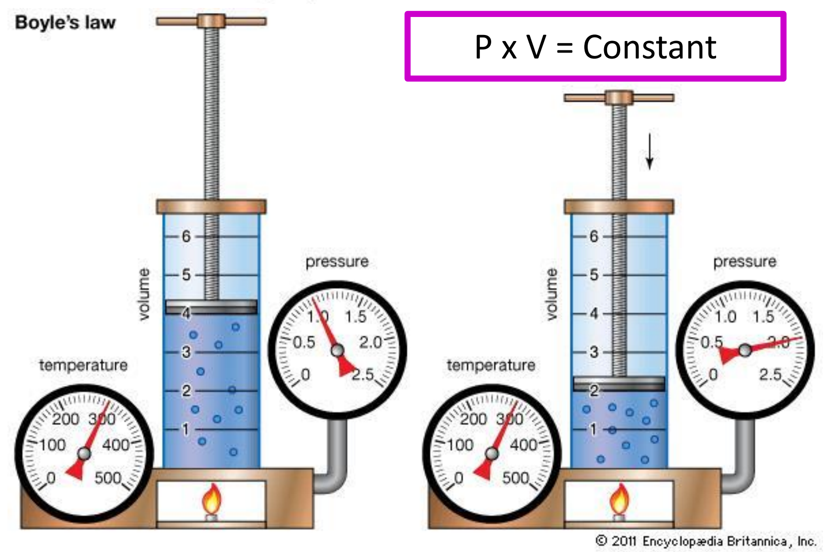


What does the graph tell you?





P x V = Constant



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Key Equations

On the Data Sheet

$$\Delta E = mc\Delta\theta$$

ΔE → Change in Thermal Energy, in Joules (J)
m → Mass, in Kilograms (kg)
c → Specific Heat Capacity, in Joules per Kilogram-Degree (J/kg^{o}C)
ΔΘ → Change in temperature, in degrees (^{o}C)

$$p\,V = Constant$$

p → Pressure exerted by gas, in Pascals (Pa) or Newtons per square metre (N/m^2)
V → Volume of gas, in Cubic metres (m^3)

Not on the Data Sheet

$$\rho = \frac{m}{V}$$

ρ → Density, in kilograms per cubic metre (kg/m^3)
m → Mass, in Kilograms (kg)
V → Volume, in Cubic metres (m^3)

$$E = mL$$

E → Energy absorbed or released, in Joules (J)
m → Mass, in Kilograms (kg)
L → Specific Latent Heat, in Joules per Kilogram (J/kg)