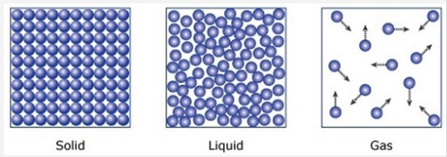
Science– Matter (Physics)

Year 9 Core Term 2

(1) States of matter and changes of state

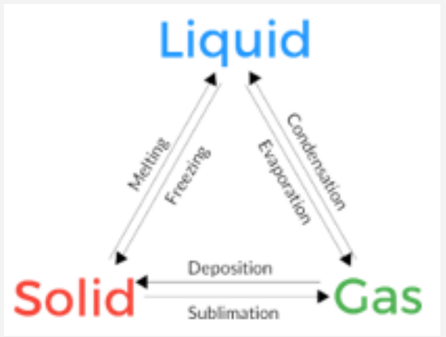
Particles are held in state by intermolecular forces.

Solids-Particles are closely packed together in neat rows. They vibrate and have strong intermolecular forces. They have the highest density.



Liquids-Particles are close together but can flow. They have weaker intermolecular forces than solids, but stringer than gases. They have a medium density.

Gases- Particles are far apart and move randomly. They have weak intermolecular forces and the lowest density.

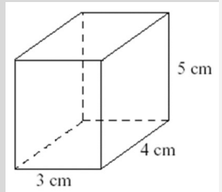


(2) Density

Density is a measure of how much mass there is a certain volume.

Mass- How much of matter there is
Volume- How much space it takes up

Density (g/cm^3) = mass (g) ÷ volume (cm^3)

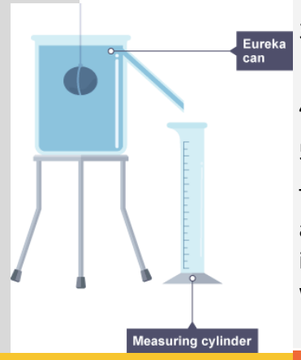


<u>Calculating density of a regular object (e.g. a cube)</u>:

1. Measure mass using a digital mass balance
2. Use a ruler to measure length, width and depth and multiply them to calculate volume

<u>Calculating density of an irregular object</u>:

1. Measure mass using a digital mass balance
2. Use a Eureka can to measure the volume of the object. To do this, fill the Eureka can with water to the spout. Place the object in the Eureka can. The volume of water displaced is equal to the volume of the object.



(3) Specific heat capacity and PAG

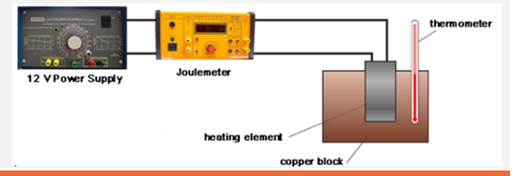
Specific heat capacity is the energy needed to change the temperature of 1kg of a material by 1°C. The units of measurement are J/kg°C.

Energy (J) = m (kg) x SHC (J/Kg°C) x ΔT (°C)

To investigate SHC of a metal block:

1. Measure the mass of the block using a digital mass balance
2. place a heater inside the metal block and measure a starting temperature using a thermometer.
3. Turn the heater on for 10 minutes, then measure an end temperature of the block
4. Use a joulemeter to measure the energy supplied.
5. Use the equation to calculate SHC

To improve the accuracy, we can insulate the metal block with an insulator.



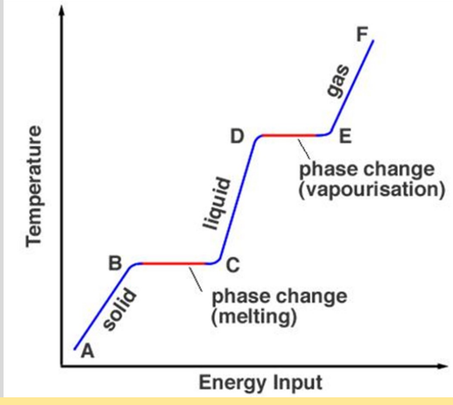
(4) Specific latent heat and heating/ cooling curves

Specific latent heat is the amount of energy needed to change the state of 1kg of a substance.

Energy (J) = mass (kg) x SLH (J/kg)

Between A-B, C-D and E-F on the graph, thermal energy is used to increase the kinetic energy in the particles and therefore their temperature.

When the graph plateaus (B -C and D-E), thermal energy is used to overcome the intermolecular forces between particles and change the state. These are the melting and boiling points.



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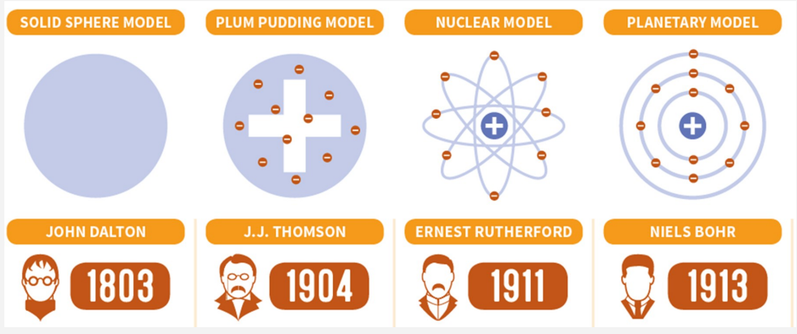
Trinity TV > Year > Science

(5) History of the atom– D Ts R Bohr-ing



Dalton– Dalton said that everything was made of atoms which where small, indivisible spheres that could be different types called elements.

Thomson– The Plum Pudding model stated that there were negatively charged electrons scattered randomly in a positive mass .

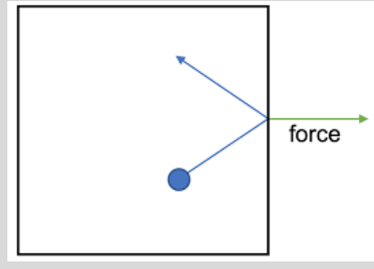
Rutherford– Rutherford did the Gold foil experiment where he shot positively charged alpha particles at gold foil. Most of these went straight through so he concluded the atom was mostly empty space. A small number of alpha particles were deflected so he concluded that there was a small, positively charged nucleus in the centre.

Bohr– Bohr added to Rutherford's model, stating that electrons were found on energy levels called shells.

(6) Gas pressure

Gas pressure is a force on a container caused by the collision of particles with the container walls.

When this happens, the collisions exert a force at 90° to the surface



<u>Gas pressure can be increased by:</u>

- Increasing temperature , as gas particles have more kinetic energy.
- Increasing number of particles, as there are more particles to collide with the walls of the container
- Decreasing area, as particles are more likely to collide with the inside of the container.

Pressure (Pa) x volume (m^3) = constant