

The particulate nature of matter

1) The three states of matter are solid, liquid and gas.

- solids- particles have a regular arrangement and are close together, least energy – particles are just vibrating
- liquids- particles have a random arrangement and are close together, particles have more energy than those in a solid, but less than those in a gas
- gases- particles have a random arrangement and are spread apart, particles have the most energy (thus motion is more random and frequent)

2) changes of state

= a physical change

- Evaporation = happens at the surface, molecules have enough energy to evaporate – i.e. go from liquid to gas
- Boiling = happens throughout the liquid, liquid to gas
- Freezing = liquid to solid
- Melting = solid to liquid
- Condensation = gas to liquid
- Sublimation = solid to gas

- Melting and freezing take place at the melting point
- Boiling and condensing take place at the boiling point

3) Kinetic theory can help to explain melting, boiling, freezing and condensing...

- amount of energy needed to change state (from s to l, from l to g) depends on the strength of the forces between the particles of the substance.
 - nature of the particles involved depends on the type of bonding and the structure of the substance.
 - stronger the forces : higher the melting point and boiling point of the substance.
 - more kinetic energy (from increased temperature)-> more movement-> change of state from (s) to (l) to (g)
- 4) gases, pressure, temperature
- higher the pressure = the more motion of a gas' particles

The particulate nature of matter (cont)

- higher the temperature = the more motion of a gas' particles

5) Brownian motion

=particles in fluids move randomly

-this is because they move around and collide with each other

- evidence: random movement of pollen grains in water

6) Diffusion

=movement of particles from an area of high concentration to an area of low concentration

-particles must be able to move(diffusion does not occur in solids)

-a smell does not travel very fast, because the particles collide with particles of air, changing direction randomly when they collide, taking much longer to travel from place to place

-molar mass and diffusion: the smaller the molecular mass, the greater the average speed of the molecules (small m_r = fast diffusion)

experimental techniques: apparatus

Appropriate apparatus for measuring...

- o Time: stopwatch/clock
- o Temperature: thermometer
- o Mass: balance
- o Volume: measuring cylinder, burette, pipette

experimental techniques: Chromatography

-Used to separate mixtures, give information to help identify substances

-stationary phase and a mobile phase

-Separation depends on the distribution of substances between the phases

-to carry it out: place substances on line (in pencil) near bottom of paper, place in solvent and observe how far the substances travel up the paper