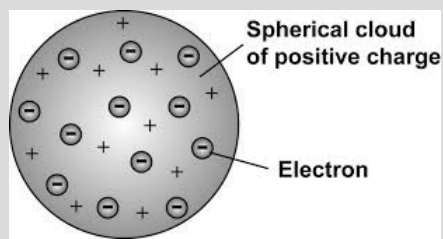


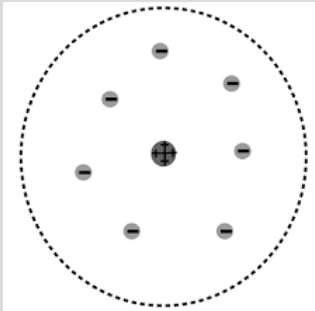
Atomic Models

Aristotle	Matter infinitely divisible
Democritus	Matter is made up of smaller parts, new matter is made up of small Lego like blocks of indivisible elements
Dalton	Matter is divisible to the extreme but not infinitely divisible.
J.J. Thompson	Uniformly spaced electrons in positively charged cloud of matter
Ernest Rutherford	Most of the atom is empty space with a dense nucleus.
Neils Bohr	Electrons exist in discrete and fixed energy shells surrounding the nucleus

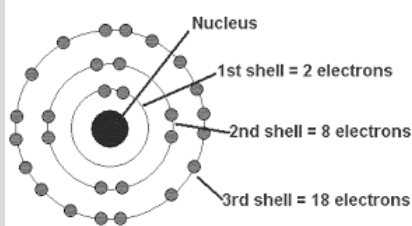
J.J Thompson's Model



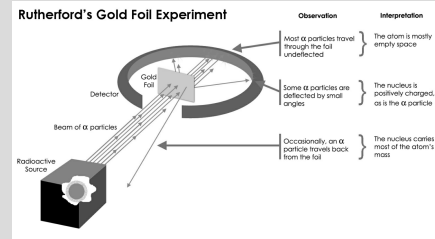
Rutherford's model



Neils Bohr's model



Rutherford's Gold Foil Experiment



Rutherford's Gold Foil Experiment Explained

In Rutherford's gold foil experiment an Alpha particle emitter is placed inside a vacuum chamber pointing at a leaf of gold foil. Around the gold foil is a circular sheet of Zinc Sulfide (ZnS). The Zinc Sulfide emits Photons (light) when it absorbs Alpha particles.

If Thompson's model of the atom was correct then the Alpha particles would have passed through largely unaffected with possibly some slight deflection

But when Rutherford ran his experiment 98% passed straight through, just under 2% deflected at a large angle and less than 1% were reflected straight back at the emitter.

Types of Radiation

Alpha particles	Helium nuclei, highly charged (+2), heavy, slow, travels few cm in air, stopped by a sheet of paper
Beta particles	Electron, -1 charge, light (1/1836 atomic mass), fast (90% light speed), stopped by 5mm of metal, travels 30cm in air
Gamma Rays	Electromagnetic radiation, shortwave length, high frequency, travels at lightspeed, can penetrate several cm of lead

Isotopes

Isotopes are atoms with varying numbers of neutrons in the nucleus. The number of protons and electrons remain the same.

Half-Life

The Half-Life of a radioactive isotope is the length of time it takes for the number of atoms of that isotope to have decreased by half, **this does not mean half the mass or volume**

Half-Life Equations

$$N = N_0 e^{-\lambda t}$$

Nuclear Equation Rules

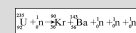
Mass number must be equal on both sides of the equation

Charge must be equal on both sides of the equation

Nuclear Fission

Fission is what happens when a large unstable nucleus absorbs a neutron, then splits in half

Uranium 235 fission equation



Nuclear Fission Reactor

Fuel Rods	Fuel rods are usually Uranium 238 enriched with 3% Uranium 235
Control Rods	Control rods are used to control the fission rate (usually made of Silver, Iridium, Cobalt, Cadmium or Boron)
Coolant	The Coolant carries energy to the steam generator. (Can be any liquid but usually Water or molten metal)

Nuclear Reactor Diagram (Fission)



Nuclear Fusion

Nuclear Fusion is when two small nuclei fuse to form a larger nucleus.

Nuclear Fusion Equation



Theory of Special Relativity

Einstein's theory of special relativity ($E=MC^2$) allows us to calculate the energy released in a nuclear reactor

Radiation Badges



C

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Published 13th March, 2016.
Last updated 8th May, 2016.
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