

A Brief History of the Atom



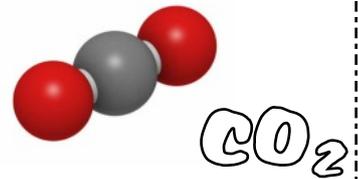
In 400 BC Greek philosopher Democritus stated that all matter is ultimately made up of indivisible particles .

He called these particles *ATAMOS*. This means indivisible.

The word atom was born.



English chemist John Dalton in 1803 stated that elements are made of the same kind of solid spheres and that chemical reactions involve new combinations of the element`s spheres.



Move onto the year 1897 and J.J. Thomson discovered the electron. The electron was found to have a negative charge. Thomson proposed that in order to keep the atom neutral it must have positive charge as well.



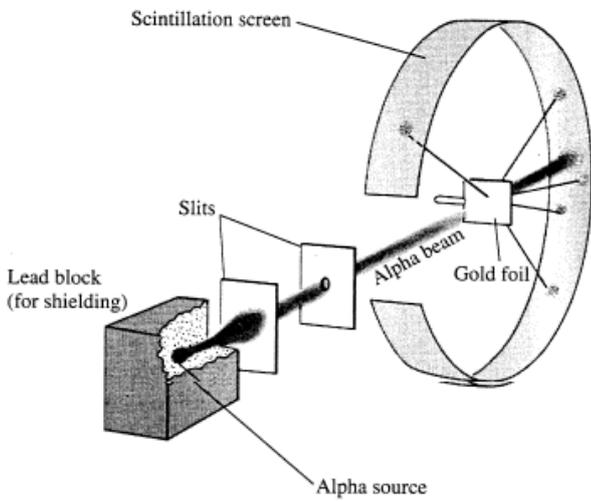
His model of the atom was that the electrons were embedded into a kind of positive dough, just like raisins in a cake.



In 1911 Ernest Rutherford fired newly discovered alpha particles at a thin piece of gold foil. He expected the alpha particles to pass through undeflected by the gold atoms.

His two research students; Geiger and Marsden made a fantastic discovery that forced physicists to rethink the model of the atom again.

Rutherford's Discovery in more detail



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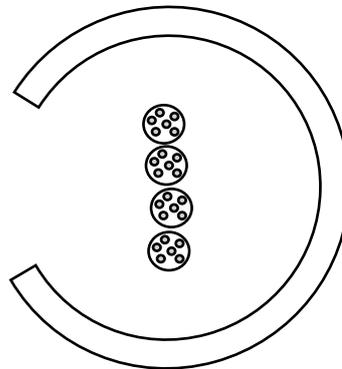
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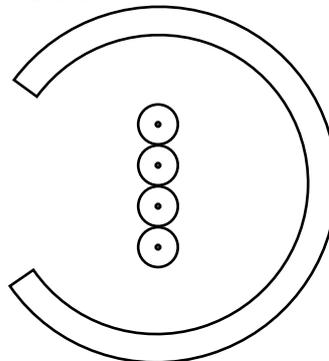
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Plum Pudding Model



Rutherford Nuclear Model





The Bohr Model of the Atom

In 1913 Danish Physicist Neils Bohr refined Rutherford`s model because it was known that electrons which orbit a nucleus would be travelling in a circle. This meant that they would be accelerating and accelerating electric charge was known to emit energy.

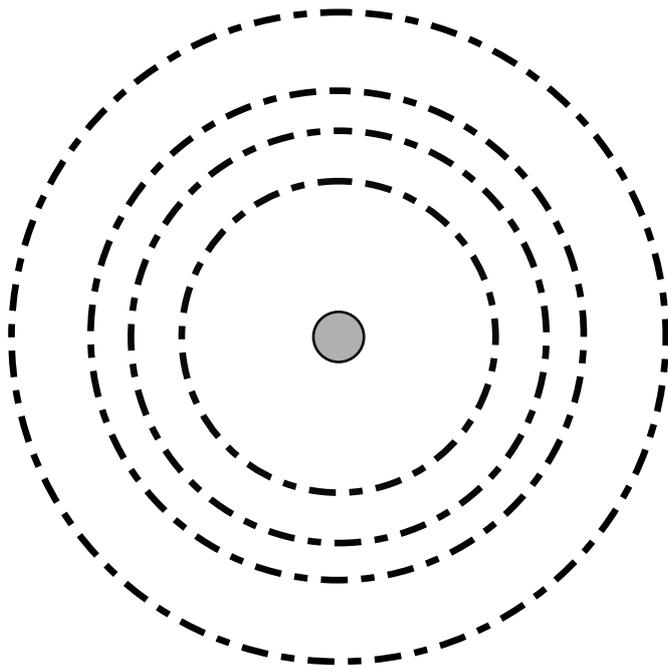
The upshot is that the orbiting electron would spiral down towards the nucleus... no atoms should exist.



Neils Bohr proposed that the electrons must orbit the nucleus in special orbits that cause them to emit no energy.

Also at that time the emission and absorption spectrums from elements showed a line structure. [Check colour picture]

Neils stated that his model would have a nucleus, mostly empty space and discrete energy levels where the electrons would have a certain energy to orbit the nucleus.

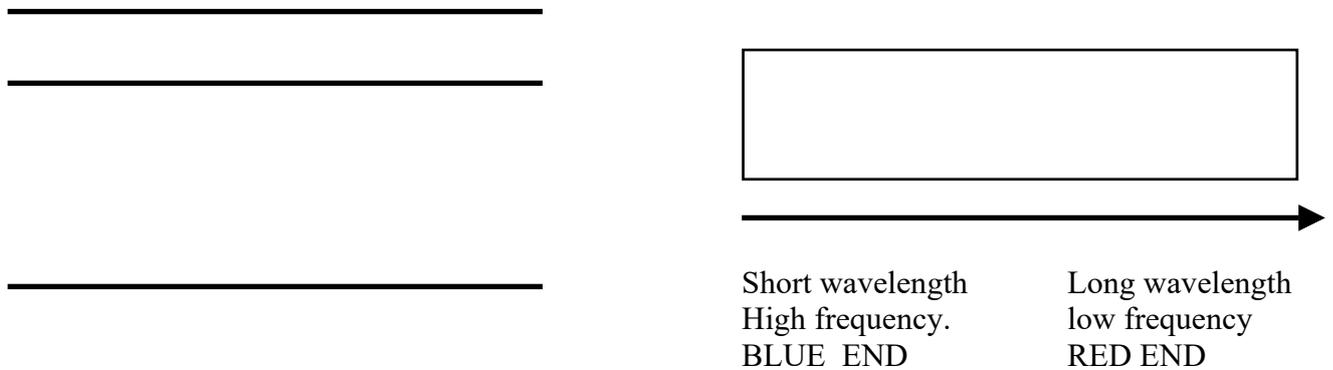




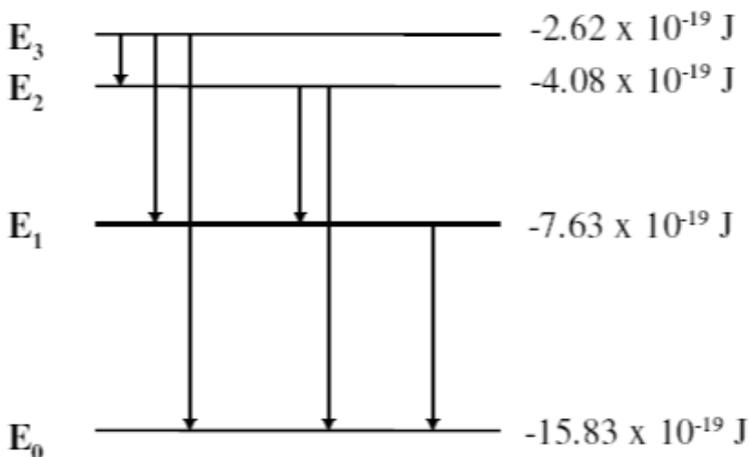
The Bohr Model of the Atom and the spectral lines.

The Bohr model of the atom could now explain why there were lines in spectrums produced by excited gases.

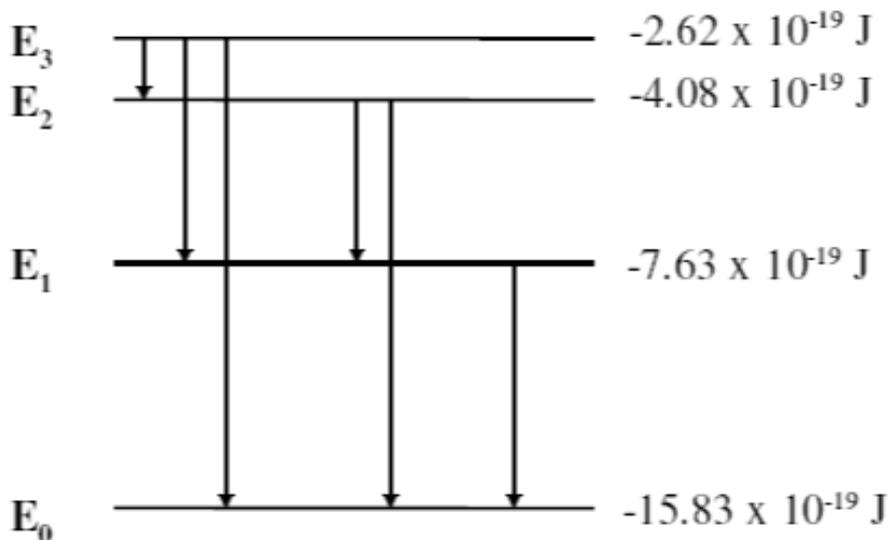
Passing electricity through a gas causes electrons in the gas to move to higher energy orbits. These electrons can then fall down to a lower energy orbit . In doing so they emit a photon of light.



Energy Level Diagrams



Emission Spectra Explained



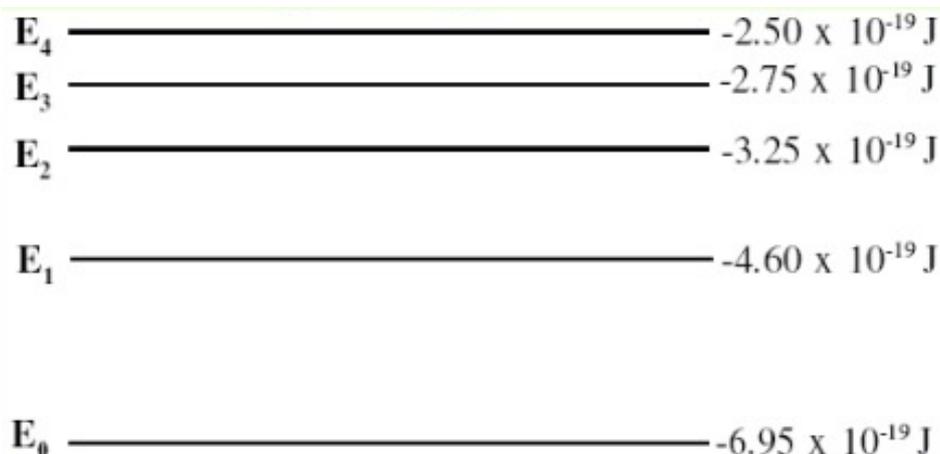
Determine the frequency of a photon which is emitted in the transition from E_2 to E_0

Determine the frequency of a photon which is emitted in the transition from E_3 to E_1

Which transition gives rise to the emission of a photon of the longest wavelength.

Which transition gives rise to emission of a photon of the shortest wavelength?

Absorption Spectra Explained



Determine the energy of a photon that will cause an electron to make an upward transition from E_0 to E_2

Determine the wavelength of a photon that will cause an electron to make an upward transition from E_1 to E_2

Only photons with the exact energy as the energy difference between the orbital levels will cause an electron to move between those levels.