

A HISTORY OF THE ATOM: THEORIES AND MODELS

How have our ideas about atoms changed over the years? This graphic looks at atomic models and how they developed.

SOLID SPHERE MODEL

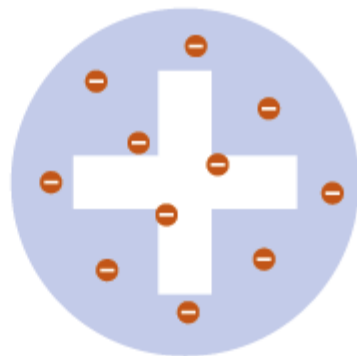


JOHN DALTON



1803

PLUM PUDDING MODEL



J.J. THOMSON



1904

NUCLEAR MODEL

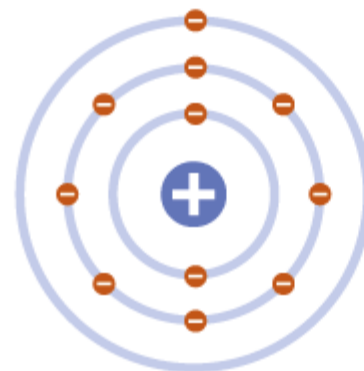


ERNEST RUTHERFORD



1911

PLANETARY MODEL



NIELS BOHR



1913

QUANTUM MODEL



ERWIN SCHRÖDINGER



1926



JOHN DALTON



1803

Dalton drew upon the Ancient Greek idea of atoms (the word 'atom' comes from the Greek 'atomos' meaning indivisible). His theory stated that atoms are indivisible, those of a given element are identical, and compounds are combinations of different types of atoms.



RECOGNISED ATOMS OF A PARTICULAR ELEMENT DIFFER FROM OTHER ELEMENTS



ATOMS AREN'T INDIVISIBLE - THEY'RE COMPOSED FROM SUBATOMIC PARTICLES



J.J. THOMSON



1904

Thomson discovered electrons (which he called 'corpuscles') in atoms in 1897, for which he won a Nobel Prize. He subsequently produced the 'plum pudding' model of the atom. It shows the atom as composed of electrons scattered throughout a spherical cloud of positive charge.



RECOGNISED ELECTRONS AS COMPONENTS OF ATOMS



NO NUCLEUS, DIDN'T EXPLAIN LATER EXPERIMENTAL OBSERVATIONS



ERNEST RUTHERFORD



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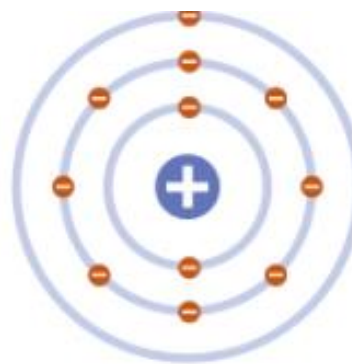
Rutherford fired positively charged alpha particles at a thin sheet of gold foil. Most passed through with little deflection, but some deflected at large angles. This was only possible if the atom was mostly empty space, with the positive charge concentrated in the centre: the nucleus.



REALISED POSITIVE CHARGE WAS LOCALISED IN THE NUCLEUS OF AN ATOM



DID NOT EXPLAIN WHY ELECTRONS REMAIN IN ORBIT AROUND THE NUCLEUS



NIELS BOHR



1913

Bohr modified Rutherford's model of the atom by stating that electrons moved around the nucleus in orbits of fixed sizes and energies. Electron energy in this model was quantised; electrons could not occupy values of energy between the fixed energy levels.



PROPOSED STABLE ELECTRON ORBITS; EXPLAINED THE EMISSION SPECTRA OF SOME ELEMENTS



MOVING ELECTRONS SHOULD EMIT ENERGY AND COLLAPSE INTO THE NUCLEUS; MODEL DID NOT WORK WELL FOR HEAVIER ATOMS



ERWIN SCHRÖDINGER



1926

Schrödinger stated that electrons do not move in set paths around the nucleus, but in waves. It is impossible to know the exact location of the electrons; instead, we have 'clouds of probability' called orbitals, in which we are more likely to find an electron.



SHOWS ELECTRONS DON'T MOVE AROUND THE NUCLEUS IN ORBITS, BUT IN CLOUDS WHERE THEIR POSITION IS UNCERTAIN



STILL WIDELY ACCEPTED AS THE MOST ACCURATE MODEL OF THE ATOM

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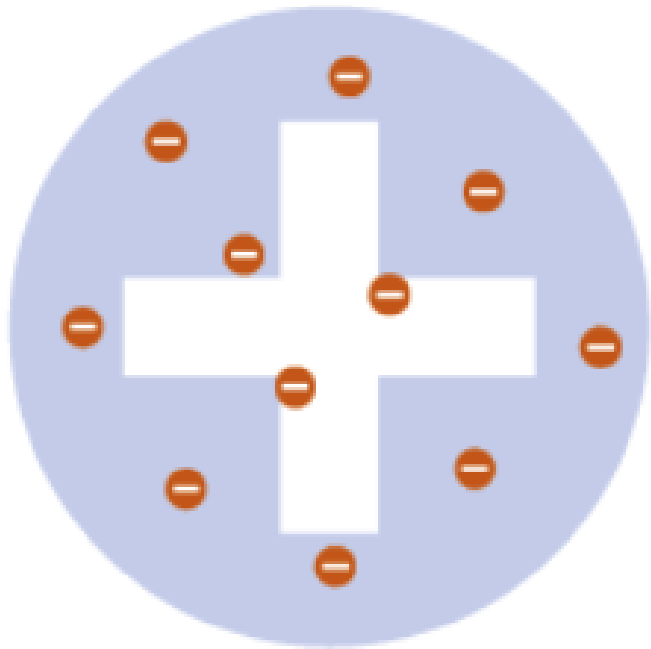


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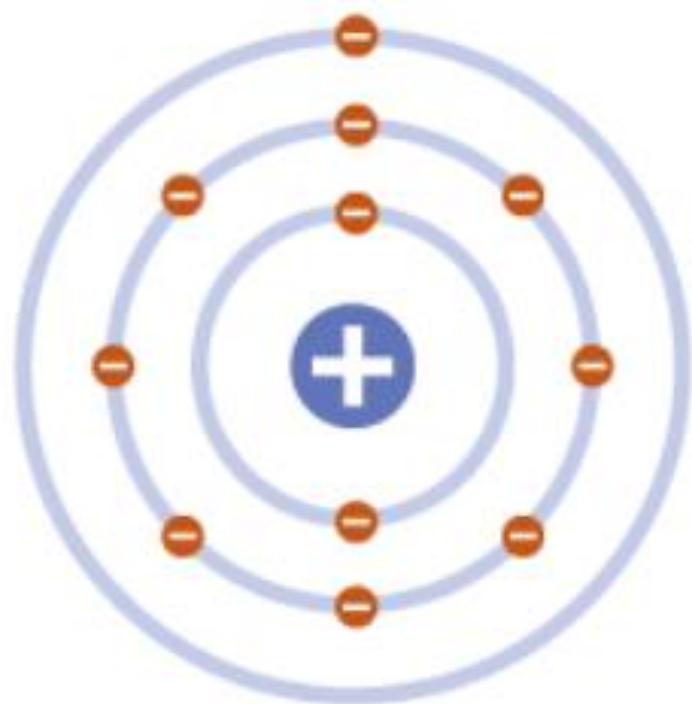


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STILL WIDELY ACCEPTED AS THE MOST ACCURATE MODEL OF THE ATOM

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