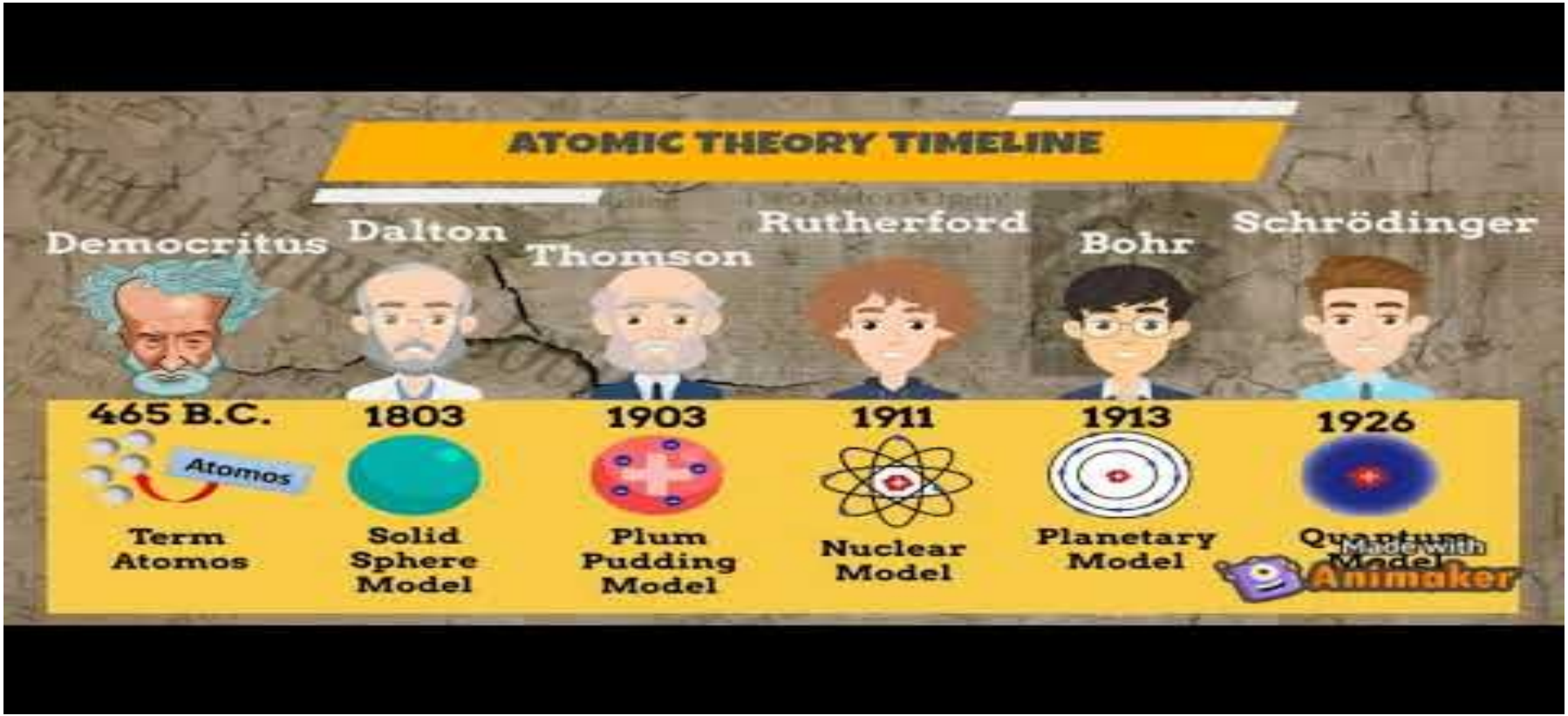

ATOMIC THEORY TIMELINE
Democritus
Dalton
Thomson
Rutherford
Bohr
Schrödinger
465 B.C.
Atomos
Term Atomos
1803
Solid Sphere Model
1903
Plum Pudding Model
1911
Nuclear Model
1913
Planetary Model
1926
Quantum
Made with
Animaker

TOK-

ATOMIC MODEL THEORY

By:
Ayaan Bhatt,
Aarjav Jain,
Aanya Goel,
Aarav Lekhadia,
Shivi Jagnani,
Mahek Dugar

Heliocentric Model

~Devraj, Deeva, Vivaan, Nandini, Heet, Vyom


Aristarchus of Samos came to the conclusion that the Earth actually revolves around the Sun since the Sun is roughly six to seven times bigger than the Earth. He came to this conclusion by combining spherical geometry with astrometry.
He created a mathematical framework to explain how heavenly bodies move.
He also developed a geocentric model that included aspects of the heliocentric theory of Aristarchus.
The Earth, in Claudius Ptolemy's opinion, is the centre of the cosmos. Geocentrism was standardized by his model. Astronomers accepted it as the correct solar system model for more than a thousand years. Aristotle's physics served as the foundation for Ptolemy's astronomy
He built on the discoveries of early astronomers and enhanced observational methods.
Aspects of the Ptolemaic system were refuted.
He proposed that the sun's rising and setting were caused by the rotation of the Earth. Additionally, he suggested that Earth's rotation was to blame for the planets' retrograde migration across the night sky
He performed precise and thorough observations of celestial bodies.
created the Tychonic system, a synthesis of geocentrism and heliocentrism.

Galileo validated Copernicus' heliocentric theory by his observations of Venus' phases. He discovered that Venus has phases (much like the moon), which was impossible if Venus swung about the Earth.
The church was incensed by his claim. Galileo based his telescope on
European instruments that could magnify objects three times. He had a telescope that could magnify things up to 20 times.

Johannes Kepler created the first three planetary motion laws. "Planets sweep out equal areas in equal times," "all planets move in ellipses, with the sun at one focus," and "the square of the periodic times are to each other as the cubes to mean distance" and developed the heliocentric model.

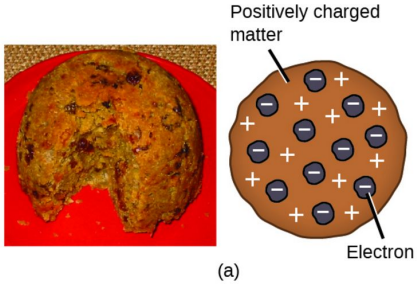
Created the universal gravitational law and the laws of motion.
gave a theoretical foundation for comprehending the heliocentric model's dynamics.

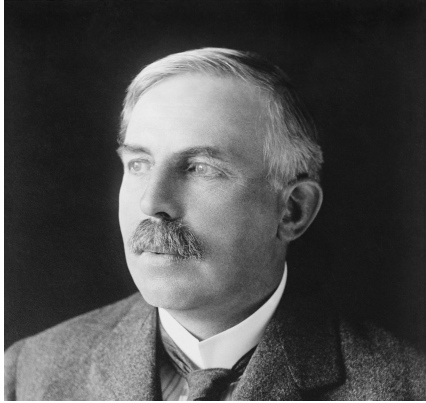
They improved Newton's principles of motion and researched the stability of the solar system.
helped celestial mechanics grow and provided more evidence in favour of the heliocentric paradigm.

The separation between stars and planets was initially published by Bessel, an astronomer. Using the best telescopes, he spent 28 years working on this subject. He argued against stellar parallax, which states that the sun only seems to move in relation to farther-off objects. His findings gave the heliocentric hypothesis of the solar system its conclusive justification.

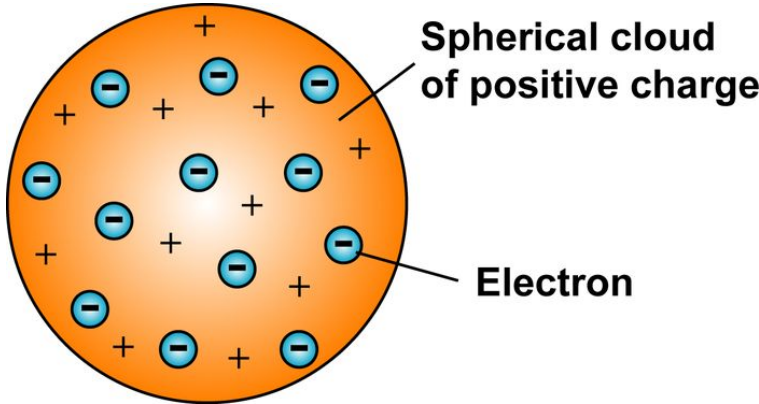
Thank You

Plum Pudding Model





- The plum pudding model, proposed by J.J. Thomson in 1904, described the atom as a sphere of positive charge with embedded electrons.
- Thomson's experiments with cathode ray tubes provided evidence for the presence of negatively charged particles within atoms, inspiring the plum pudding model.
- Subsequent experiments, such as Ernest Rutherford's gold foil experiment, revealed the existence of a dense nucleus and led to the development of Niels Bohr's planetary model, which explained the specific orbits of electrons.



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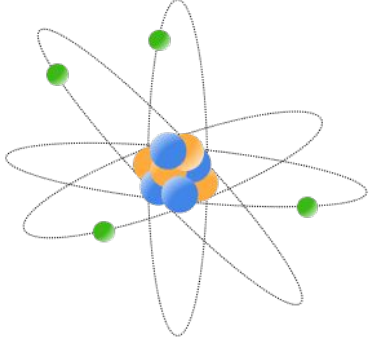
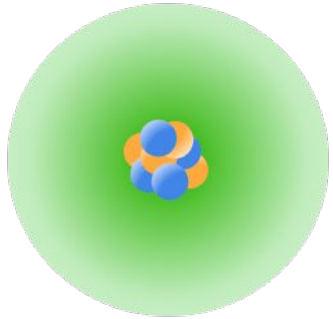
Quantum model of an atom

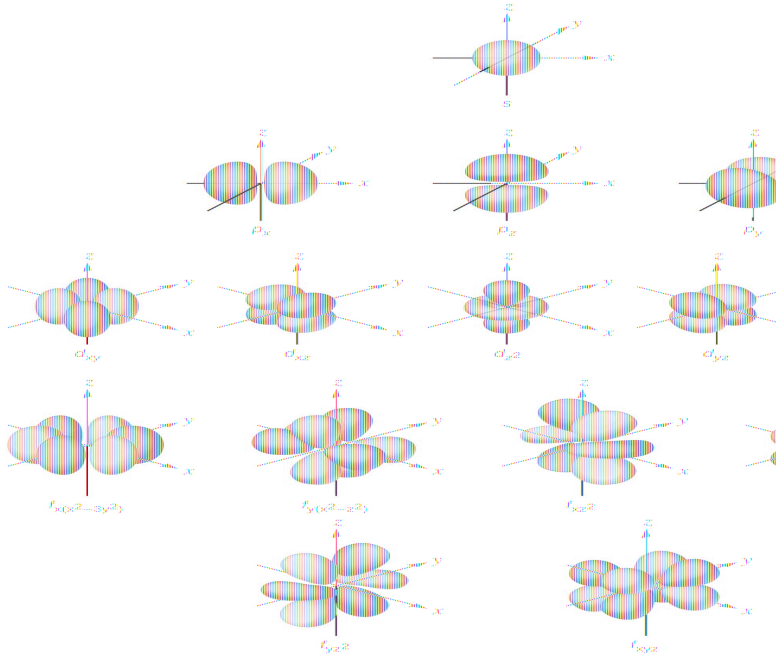
- Erwin Schrödinger took the Bohr atom model one step further in 1926, by using the Schrödinger wave equation to replace Bohr's ideas about electron location with an uncertainty factor.
- He stated that the location of the electron can only be given as a probability that the electron is somewhere in a certain area, known as the electron cloud.
- Electrons do not have a fixed circular orbit, but rather, are expected to be found in these electron clouds.



Electron Orbit Model



Electron Cloud Model



https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry_(CK-12)/05%3A_Electrons_in_Atoms/5.11%3A_Quantum_Mechanical_Atomic_Model
https://www.khanacademy.org/science/physics/quantum-physics/quantum-numbers-and-orbitals/a/the-quantum-mechanical-model-of-the-atom

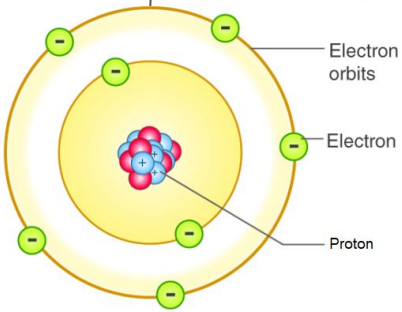
Quantum model of an atom

- De Broglie published his ideas that electrons could be thought of as a circular standing wave instead of a particle moving in fixed circular orbits.
- Erwin Schrödinger added to this theory by calculating the probabilities of the electron existing in a certain area using the Schrodinger wave function.
- An electron has a quantized level of energy and is most likely present away from the nucleus, in an electron cloud/orbital.
- Electrons can only have a discrete level of energy and cannot transition smoothly between two energy levels, but rather jumps from one energy level to another.
- When it loses energy, then a photon of the energy lost is emitted, and if it gains energy in the form of a photon of a fixed wavelength, it immediately tries to lose the energy by releasing the photon.
- The Pauli exclusion principle is also a part of this model and it states that no more than two electrons with opposite spin can exist in one orbital.

Timeline of the Quantum Model of an Atom

1913

Bohr's model of the atom restricted electrons to particles existing in clearly defined orbits



1924

Louis De Broglie proposed that all particles could be treated as matter waves

1926

Erwin Schrodinger built on De Broglie's wave model and formulated an equation that yielded a series of wavefunctions

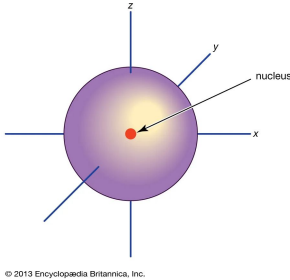
$$\hat{H}\Psi = E\Psi$$

Hamiltonian Operator (Energy operator)

Energy eigenvalue

1926

The square of the wavefunction represents the probability of finding an electron within a given region of the atom



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Today, an atomic orbital is defined as the region within an atom that encloses where the electron is likely to be 90% of the time