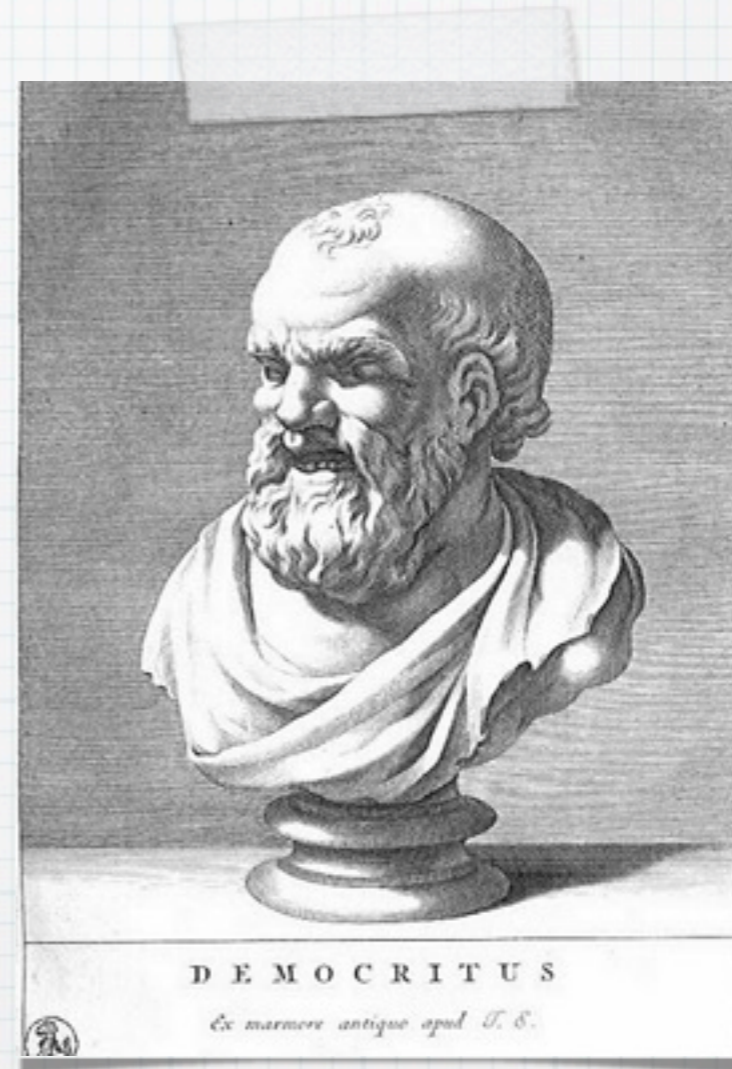


Atomic Theory

Developing the Nuclear Model of the Atom

Democritus

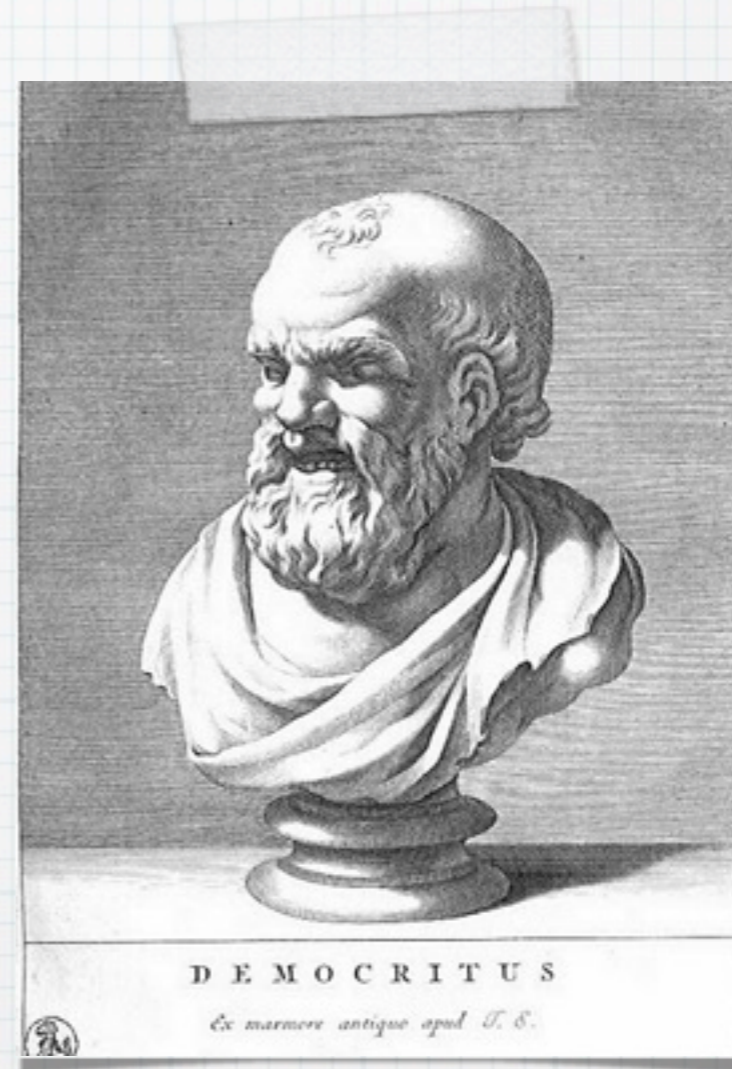
- * Theory: Atom, the indivisible particle



c. 300 BC

Democritus

- * Problem: No scientific evidence



c. 300 BC

Dalton

- * Theory: The solid sphere model
- * Atoms are seen as solid indestructible spheres



c. 1800

Dalton

- * Supports the law of conservation of mass, matter cannot be created or destroyed.
- * Problem: Doesn't explain the behavior of substances in chemical reactions



c. 1800

J. J. Thomson

- * Theory: The Raisin Bun Model
- * Atoms are positively charged spheres with negatively charged electrons distributed throughout



c. 1850

J. J. Thomson

- * Experiments using a cathode ray tube lead to the discovery of the negative particles (later termed electrons)



c. 1850

Rutherford and Chadwick

- * Theory: The Planetary Model
- * Existence of a nucleus containing positively charged protons surrounded mostly by empty space and electrons



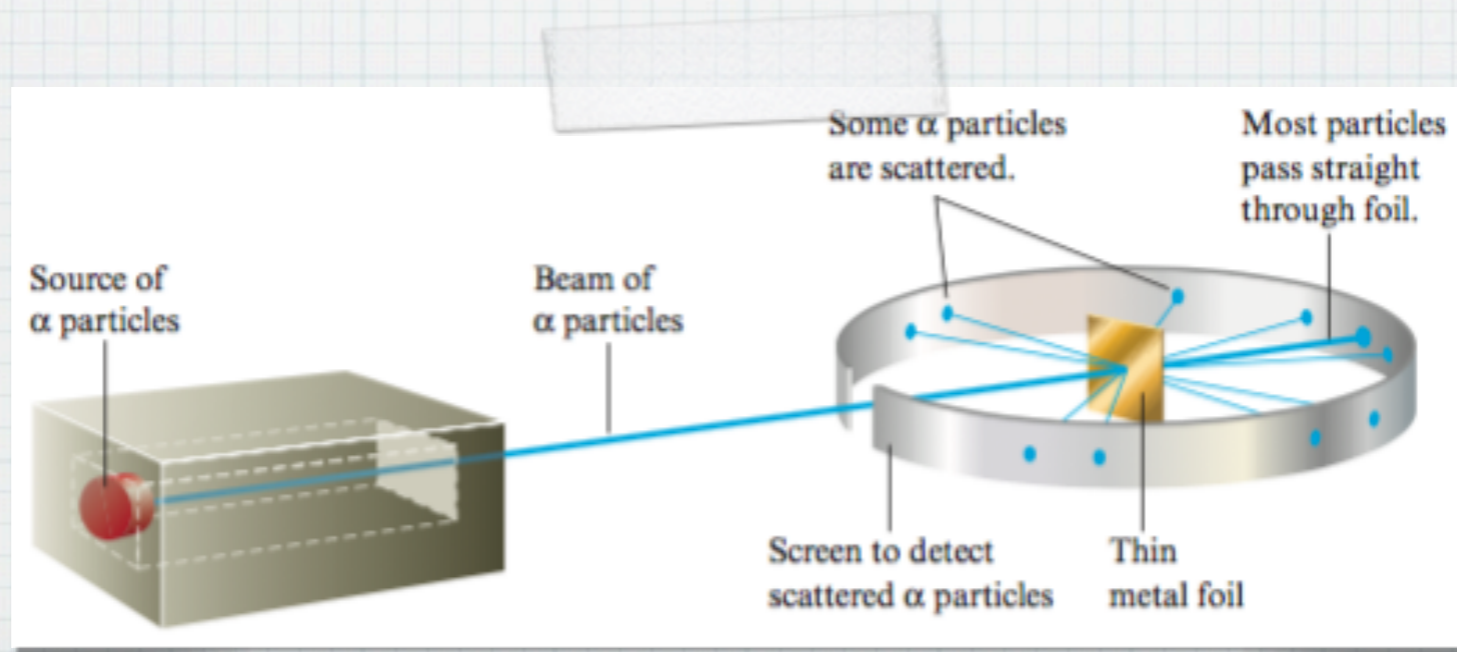
c. 1905



c. 1932

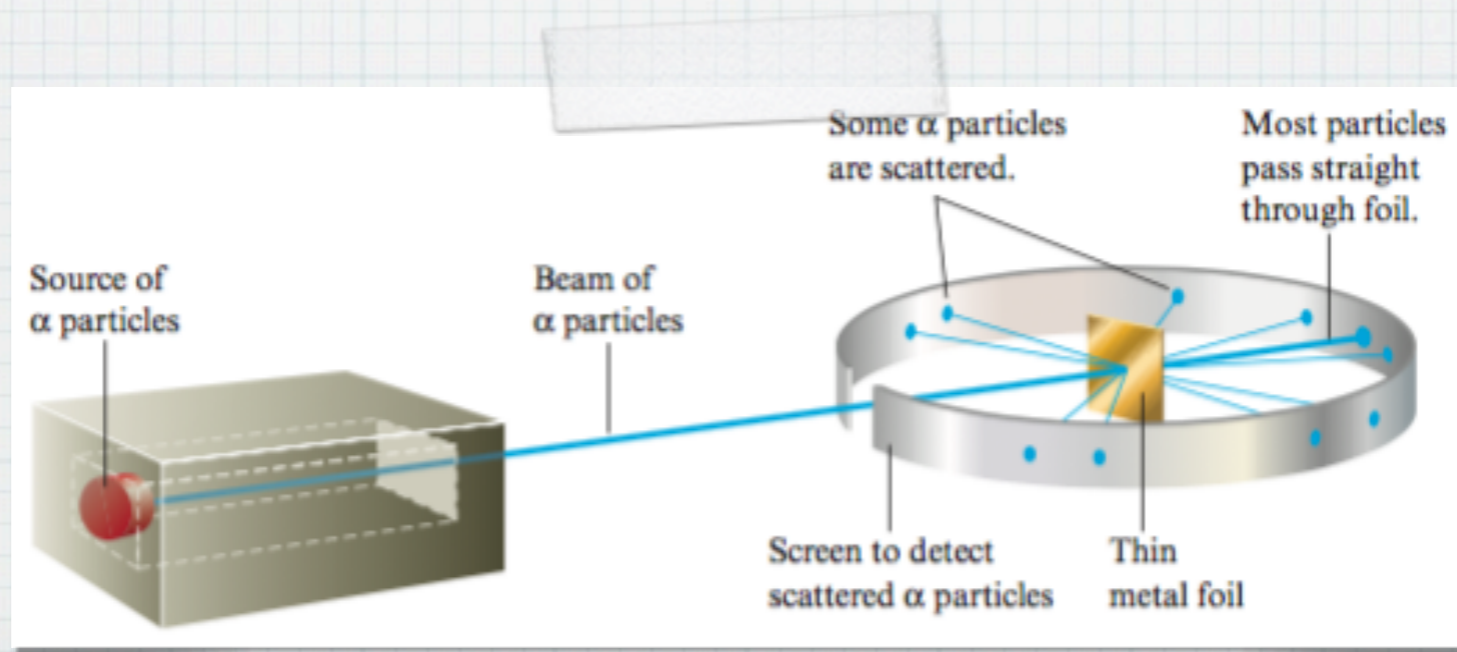
Rutherford's Gold Foil Experiment

- * Directed a single beam of alpha particles towards a piece of gold foil.



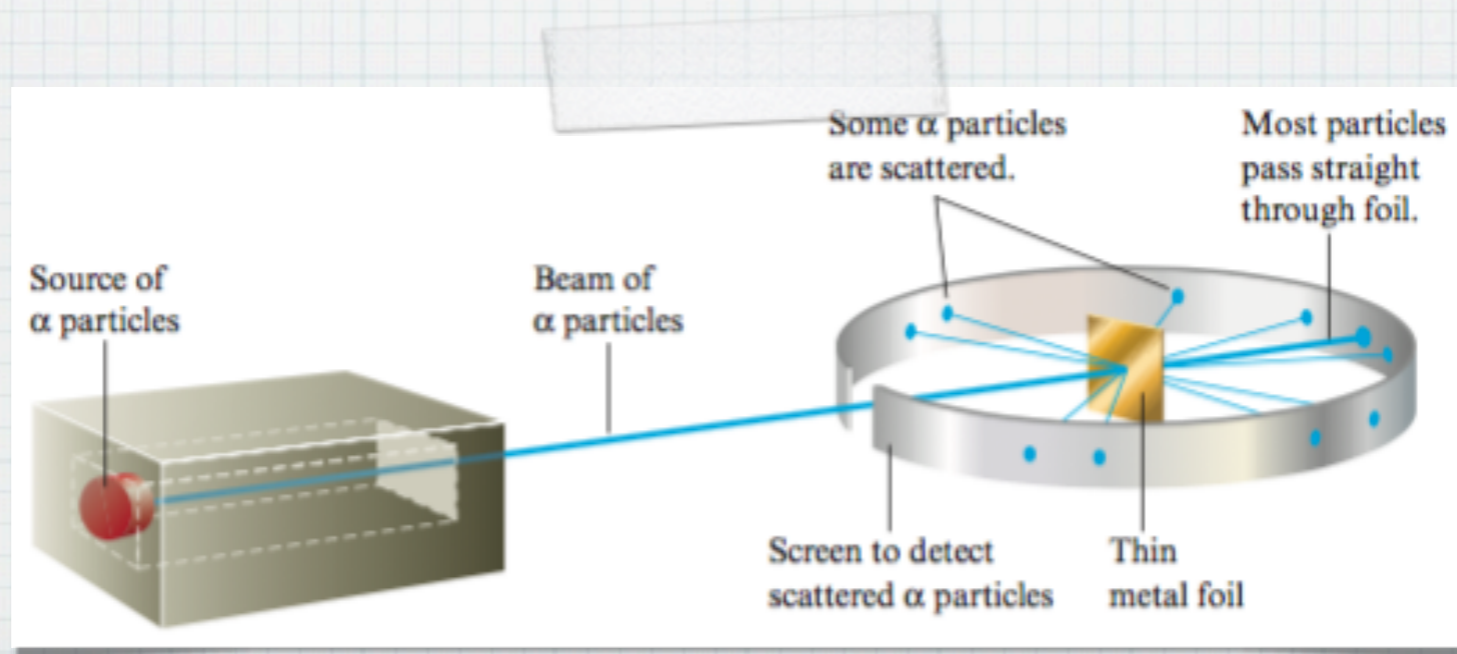
Rutherford's Gold Foil Experiment

- * Expected Results: High speed alpha particle will pass straight through the gold foil.

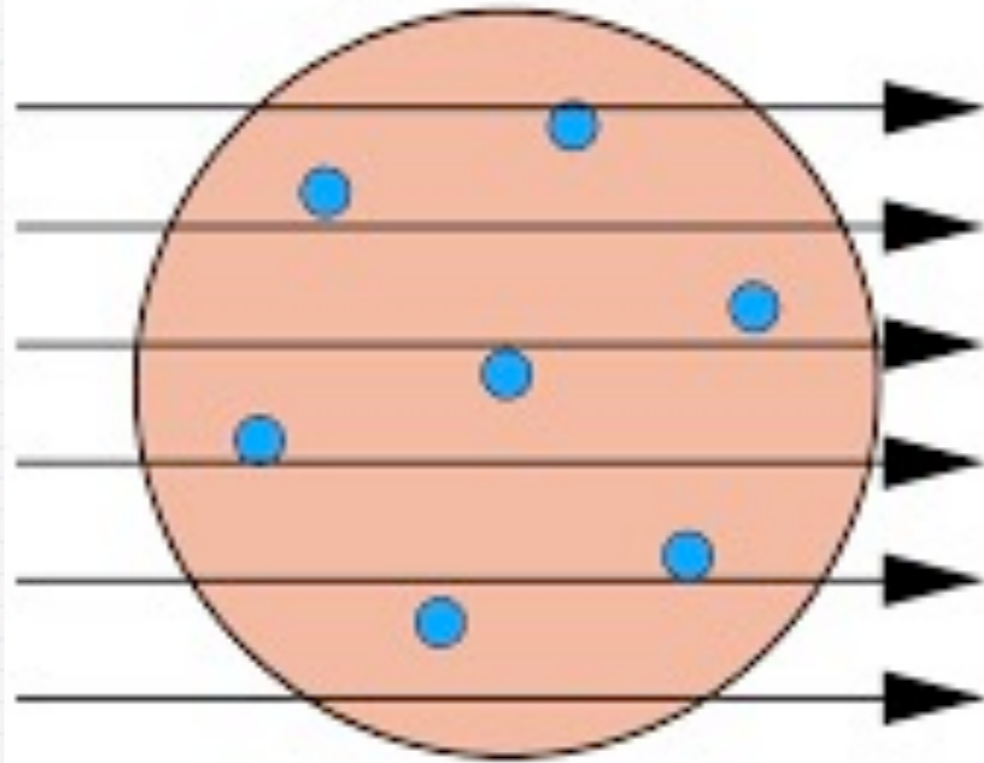


Rutherford's Gold Foil Experiment

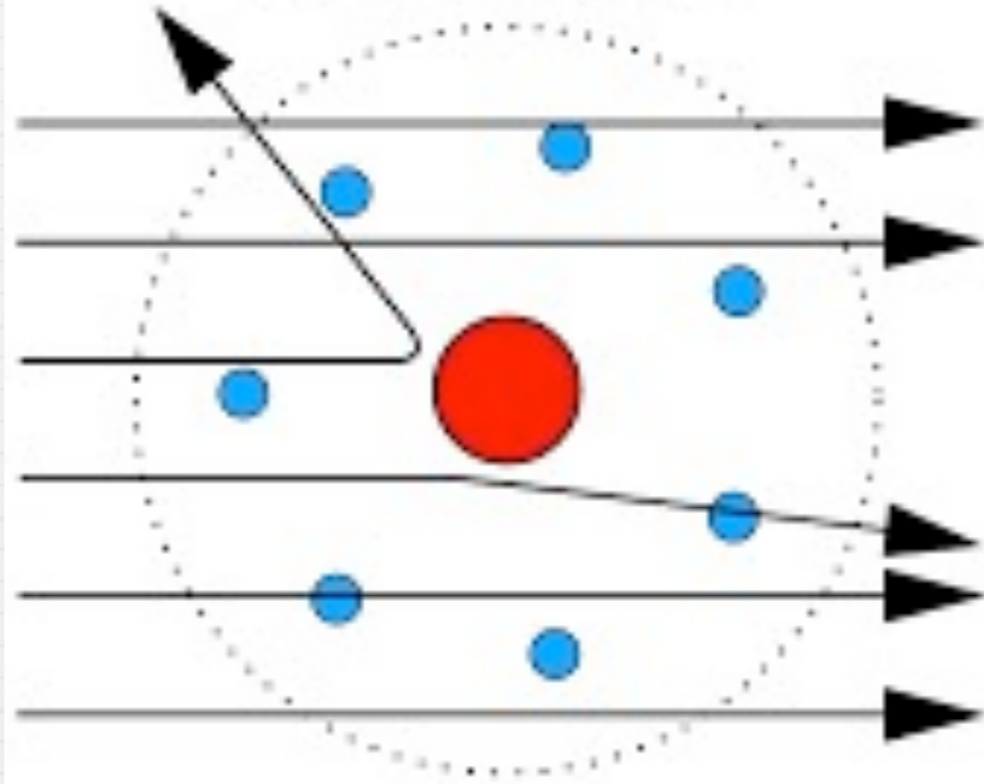
- * **Achieved Results:** Majority of the alpha particles pass through but a small number are deflected at large angles or even reflected.



THOMSON

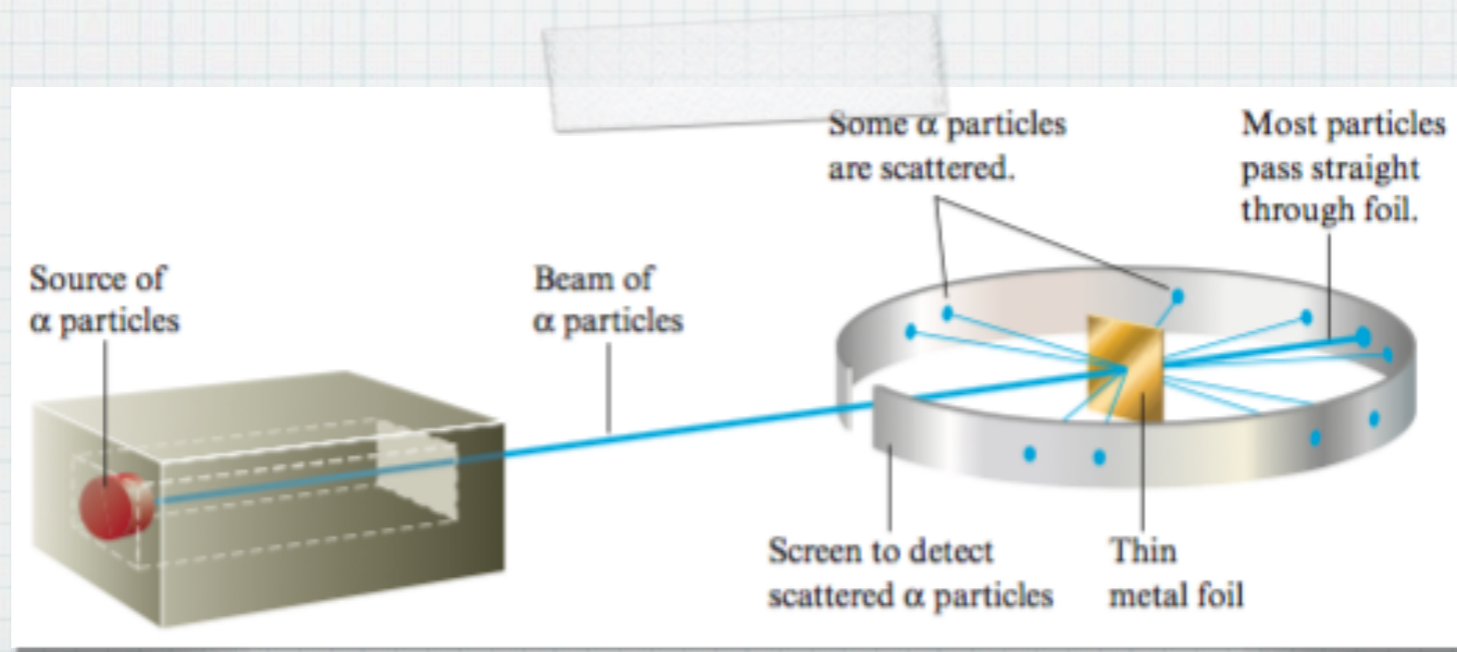


RUTHERFORD



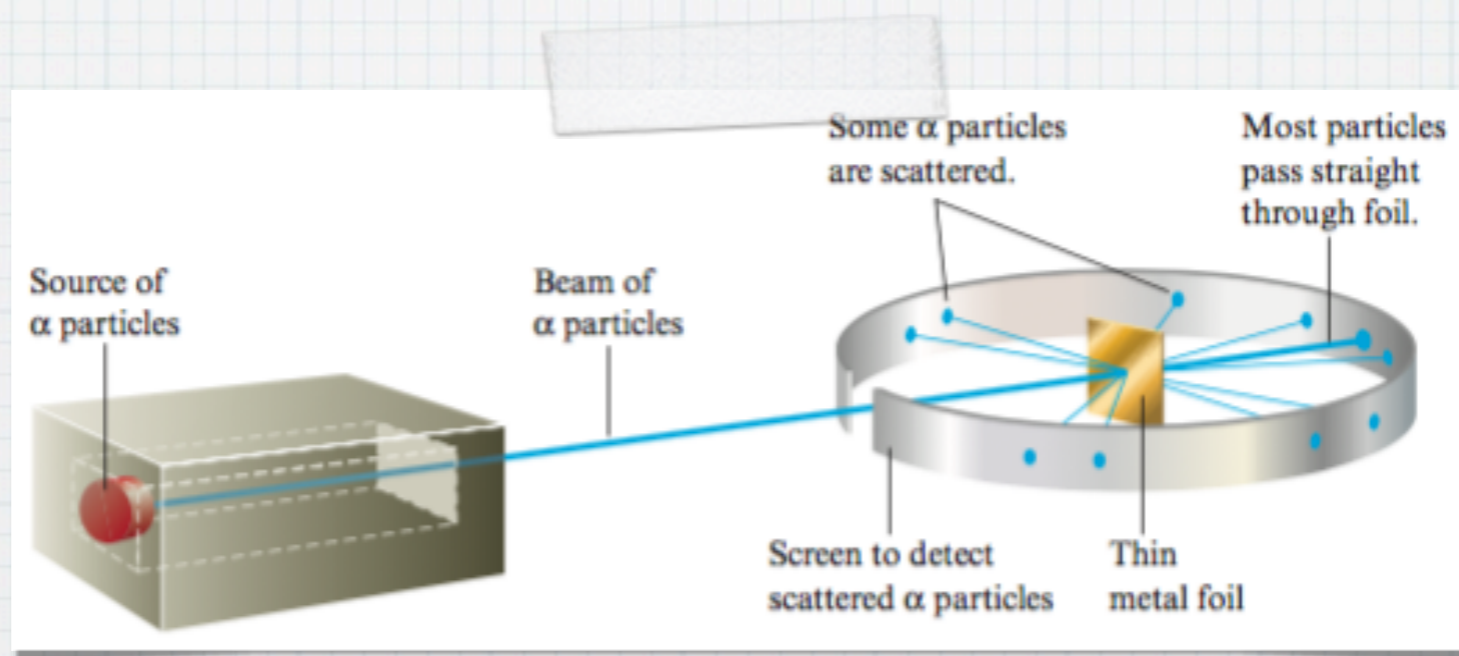
Rutherford's Gold Foil Experiment

- * **Conclusion:** The atom is made up of mainly empty space with a small massive region of concentrated positive charge.



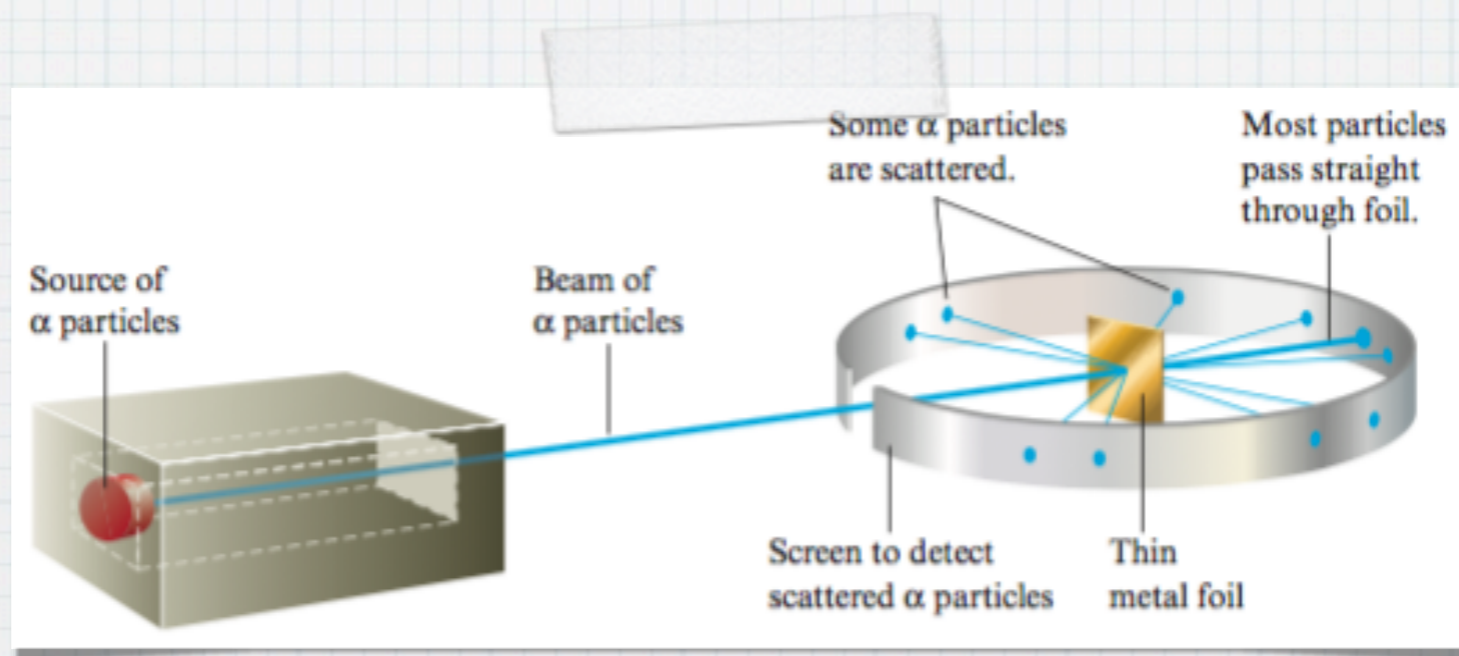
Rutherford's Gold Foil Experiment

- * This dense core was termed the nucleus.



Rutherford's Gold Foil Experiment

- * Problem: A core made up of only positives should break apart due to repulsion.

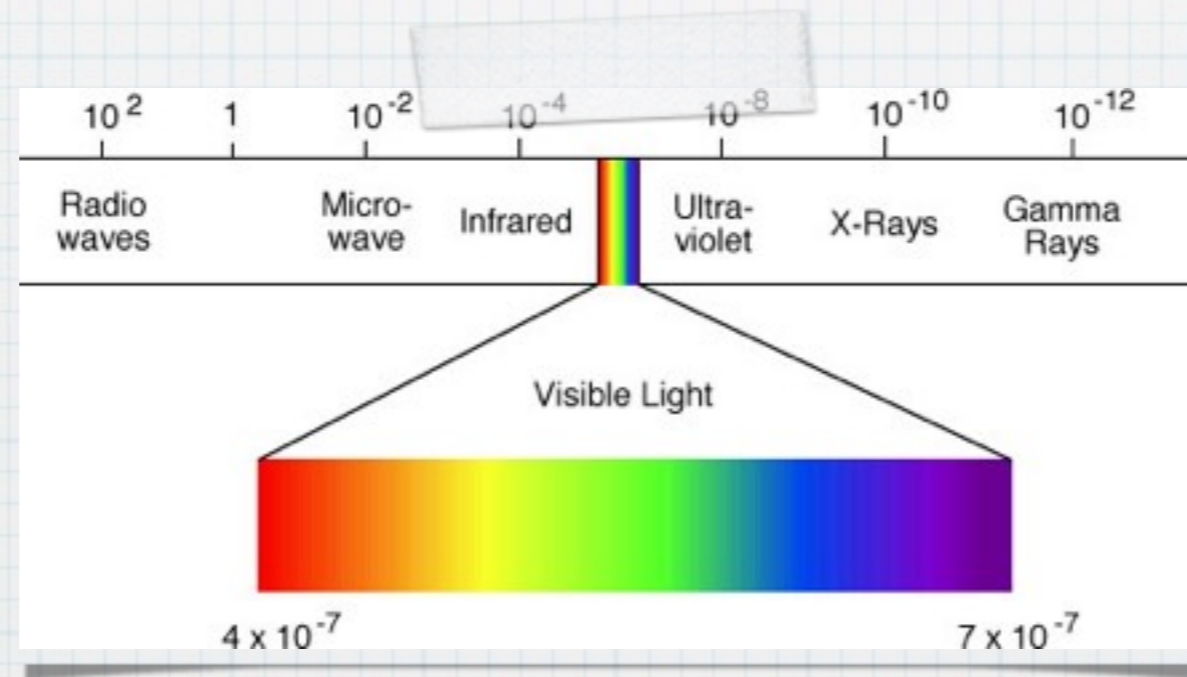


Chadwick

- * In 1932 using radiation from polonium discovered the neutrons. Neutrons act as the 'glue' holding the nucleus together.

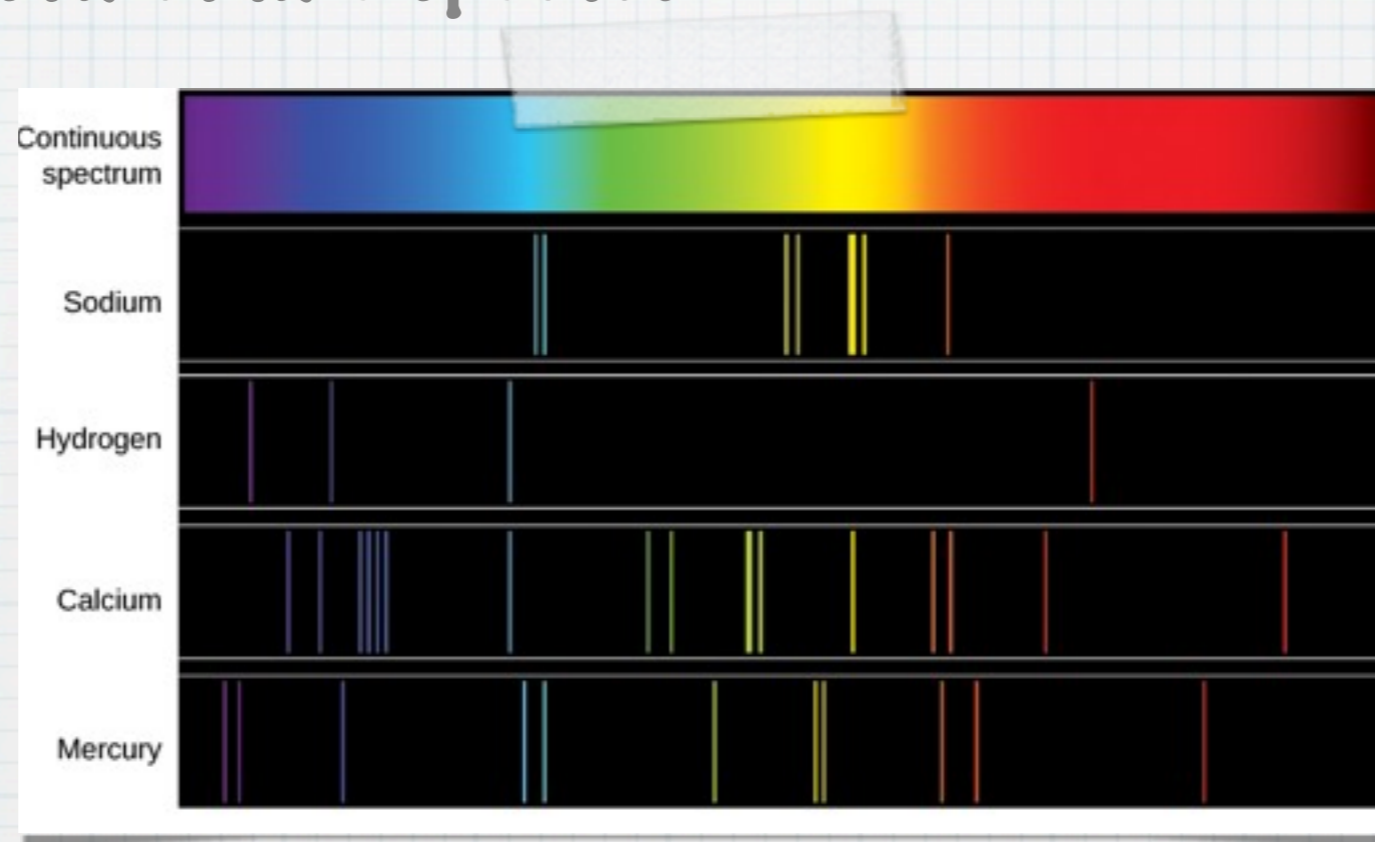
Electromagnetic Radiation

- * The visible section of the electromagnetic spectrum (the part that we can see) is called the continuous spectrum because the colours are indistinct.



Atomic Spectra

- * Instead of emitting energy as a continuous spectrum, when electrons give off energy they do so in the form of a distinct line spectra.



Bohr's Model

- * Bohr proposed a new model to explain the line spectra of hydrogen.
- * It was similar to Rutherford's but imposed restrictions on electrons.



c. 1913

Bohr's Model

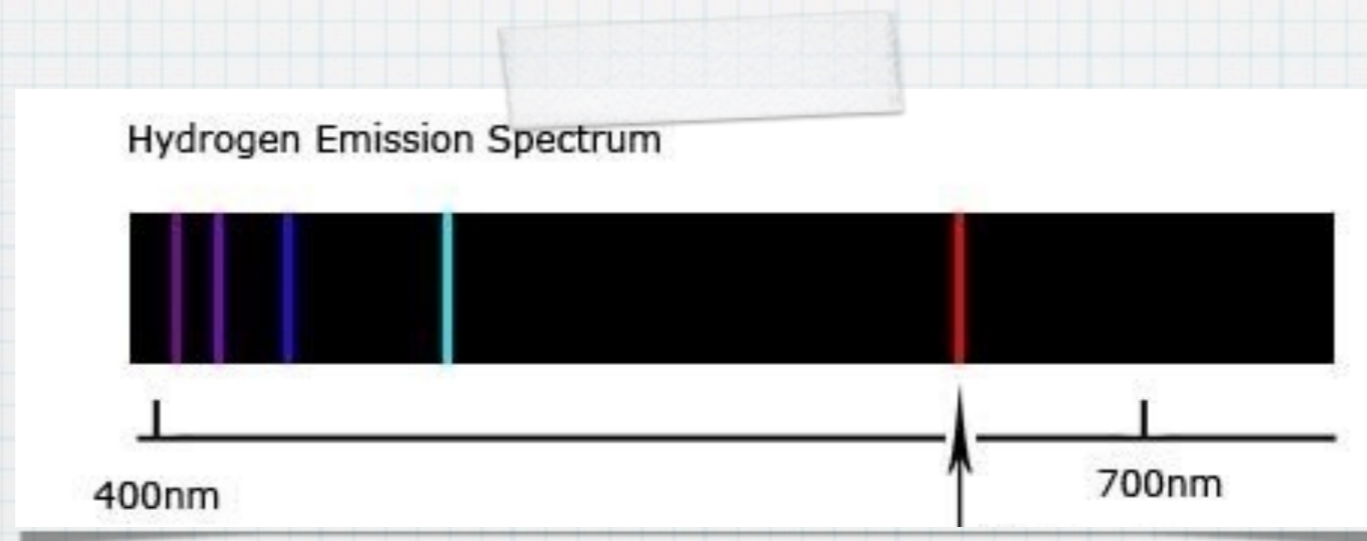
- * 1) The atom has only specific allowable energy levels (termed stationary sites).
- * 2) While in one of its stationary sites an electron does not emit energy.
- * 3) An atom changes stationary sites by emitting or absorbing specific amounts of energy.

Bohr's Model

- * Bohr based some of his theory on the research by Planck.
- * Planck stated that matter emitted energy in distinct indivisible packets called quanta.

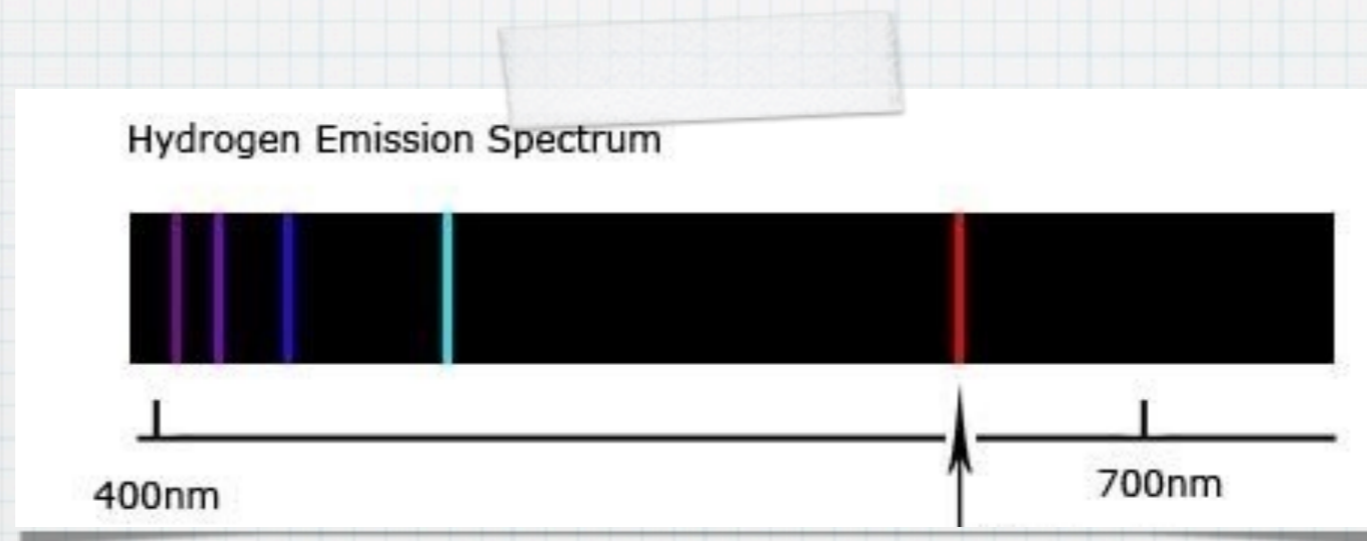
Bohr's Model

- * Therefore the energy associated with the line spectrum of hydrogen corresponds to the energy of an electron as it moves to higher or lower energy levels.



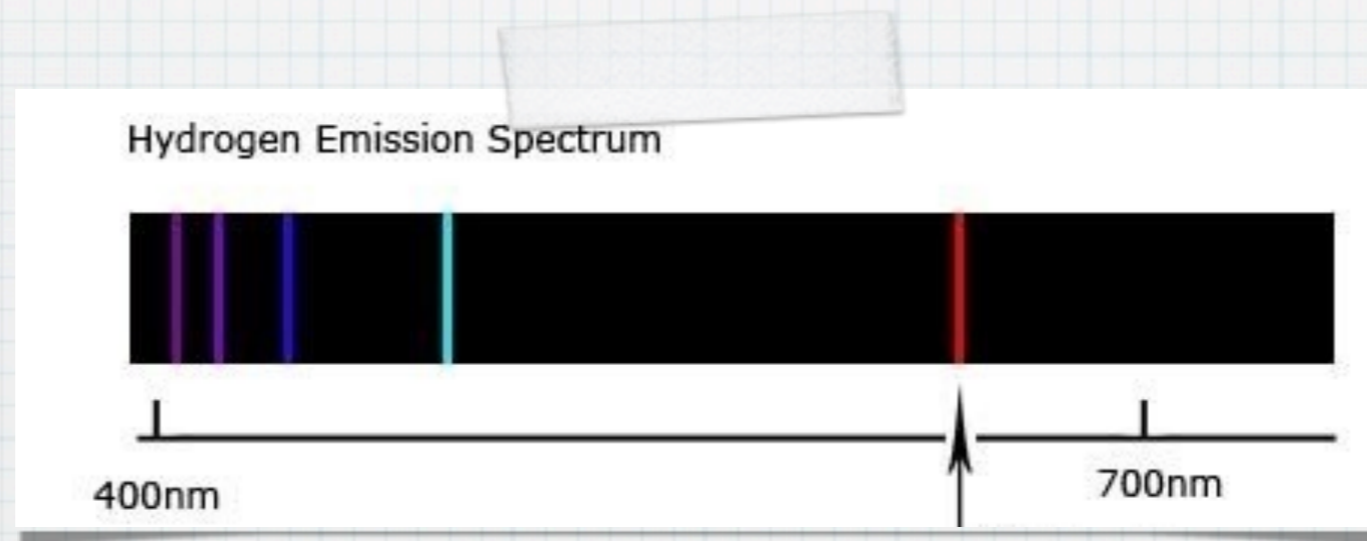
Bohr's Model

- * When an atom is exposed to energy the electron absorbs photons and is said to move to an excited state.



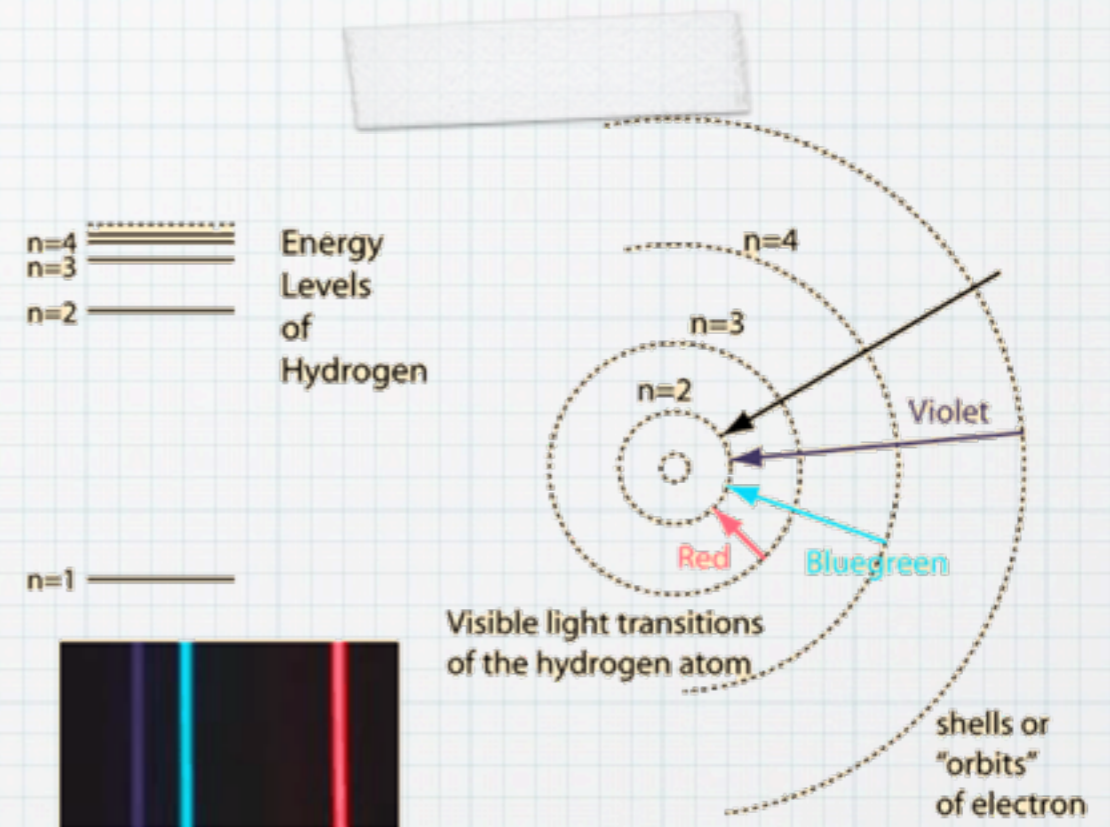
Bohr's Model

- * An atom has all electrons in the lowest energy levels, it is said to be in the ground state.



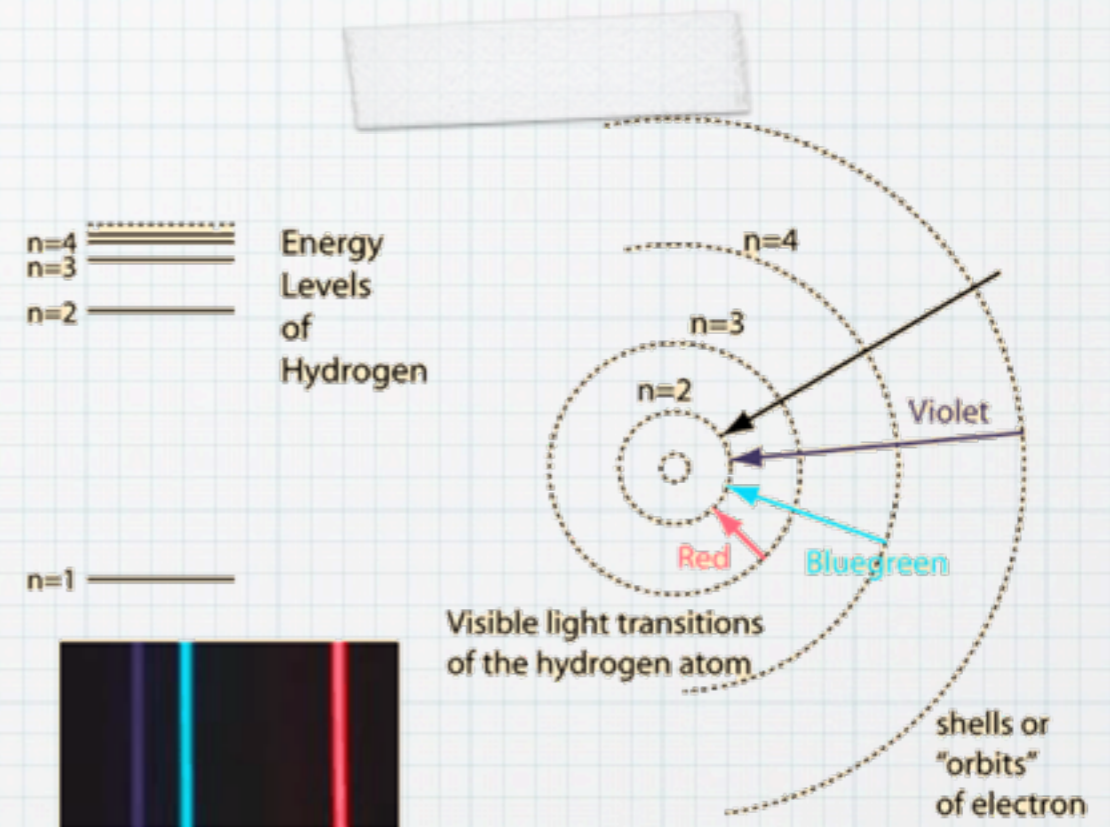
Bohr's Model

* These energy transitions were used to designate allowed levels of hydrogen.



Bohr's Model

* 'n' is referred to as the principal quantum number.



Bohr's Model

* Problem: Bohr's model can only explain the line spectra produced by one electron systems.

