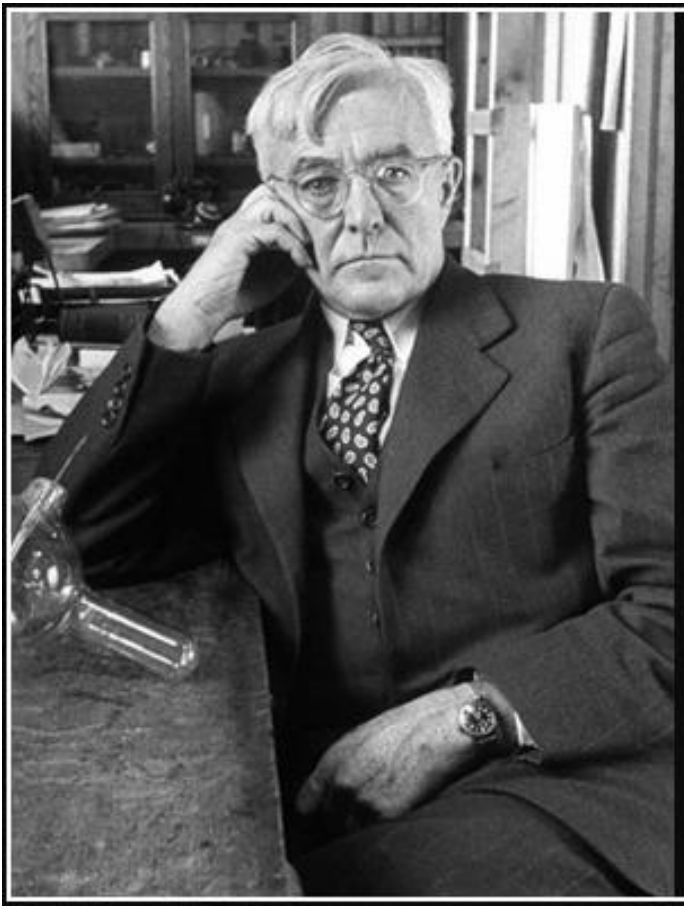
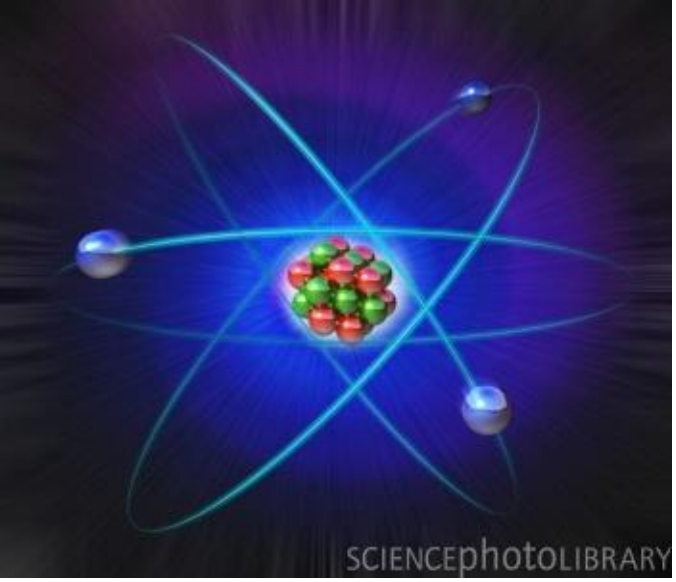
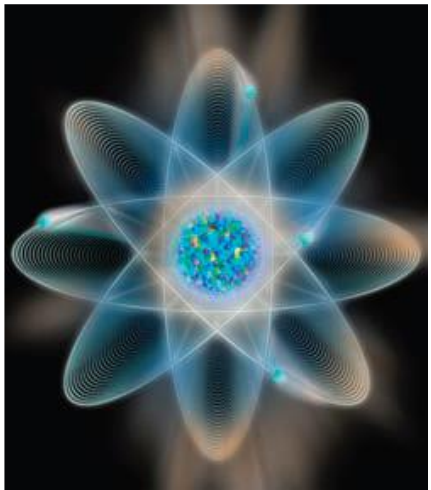


The scientist is motivated primarily by curiosity and a desire for truth.

— Irving Langmuir —



ATOMIC STRUCTURE



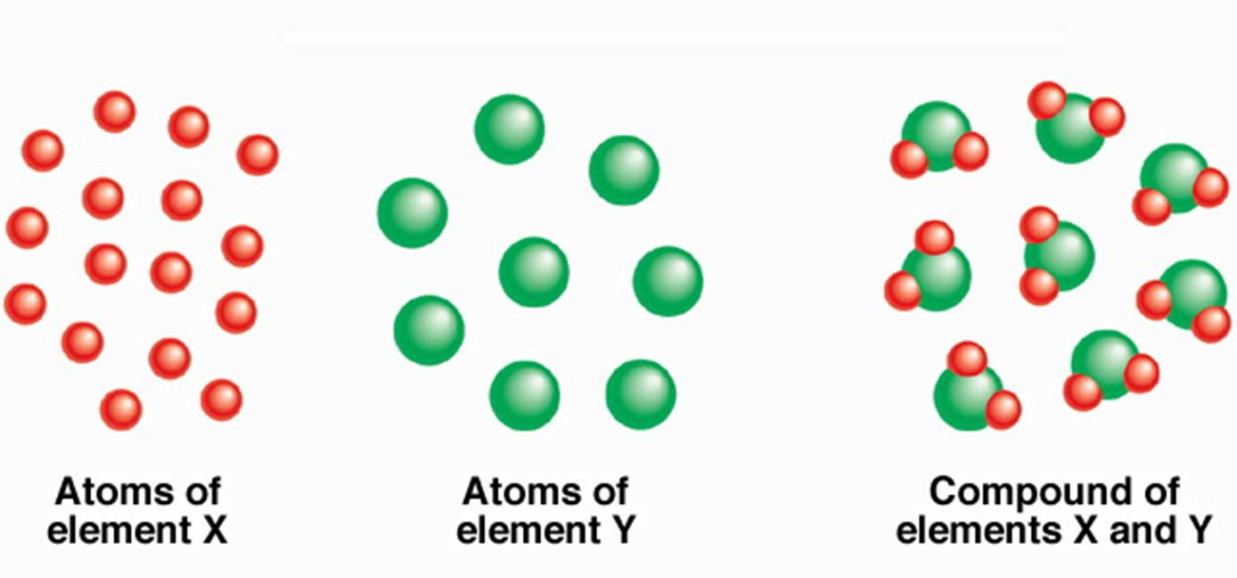
HISTORY OF THE ATOM

1808

John Dalton

suggested that all matter was made up of tiny spheres that were able to bounce around with perfect elasticity and called them

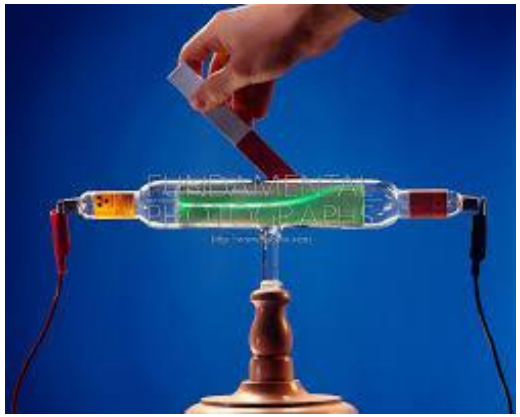
ATOMS



HISTORY OF THE ATOM

1898

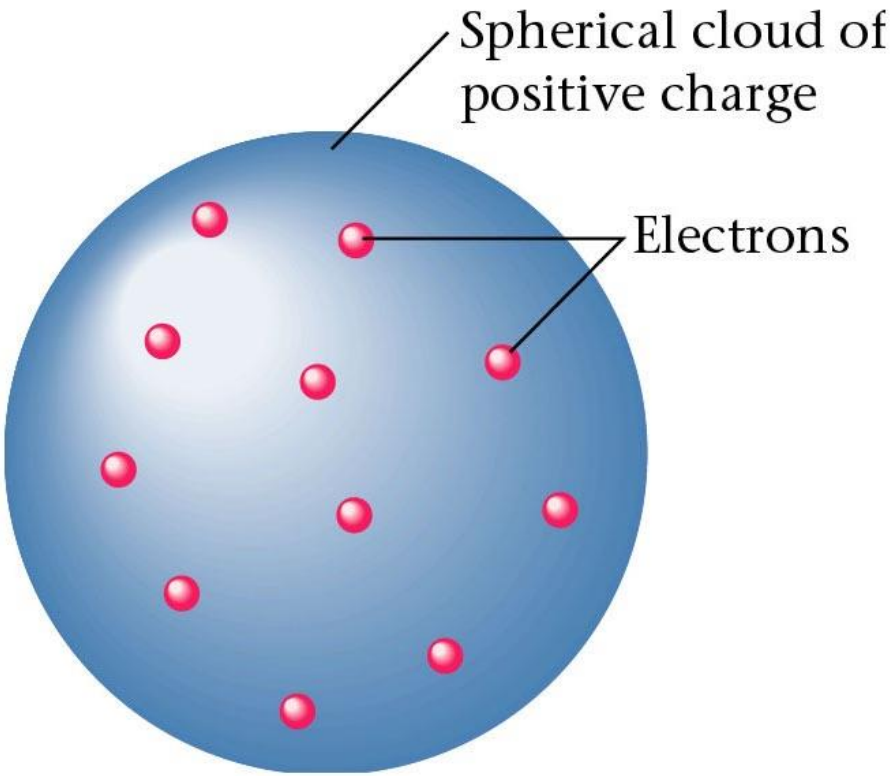
Joseph John Thompson



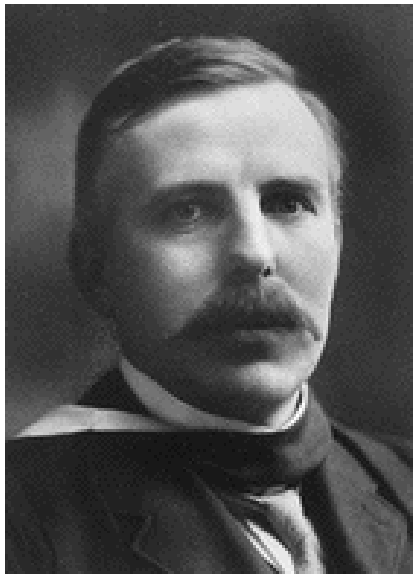
found that atoms could sometimes eject a far smaller negative particle which he called an **ELECTRON**

HISTORY OF THE ATOM

Thompson's Model of the Atom



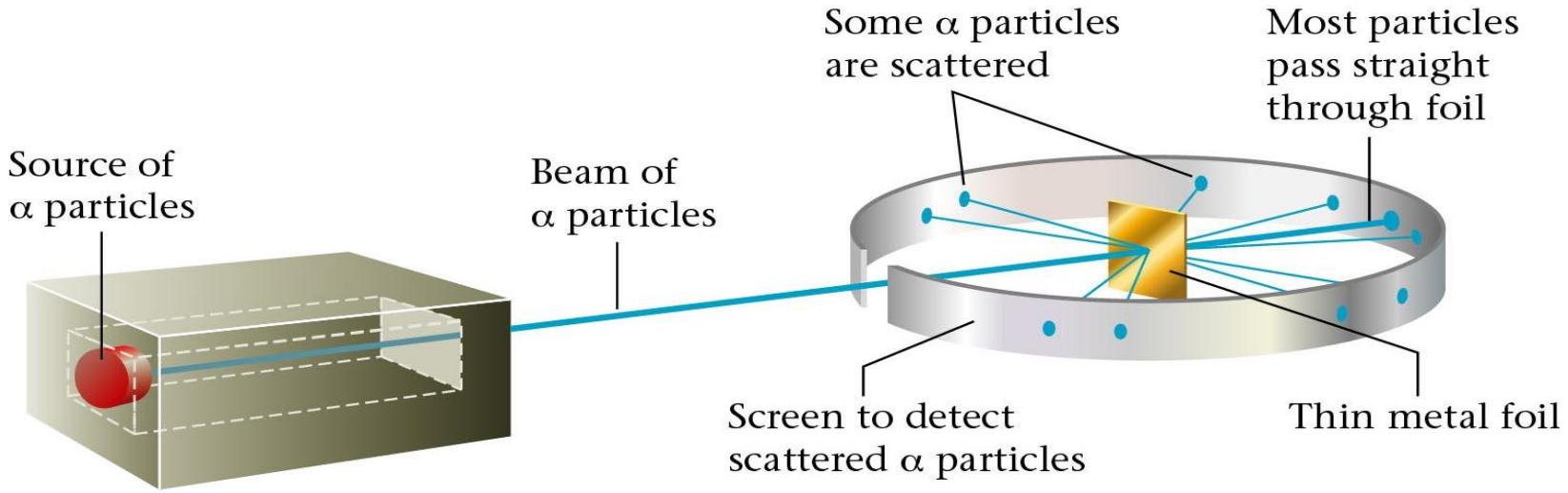
HISTORY OF THE ATOM



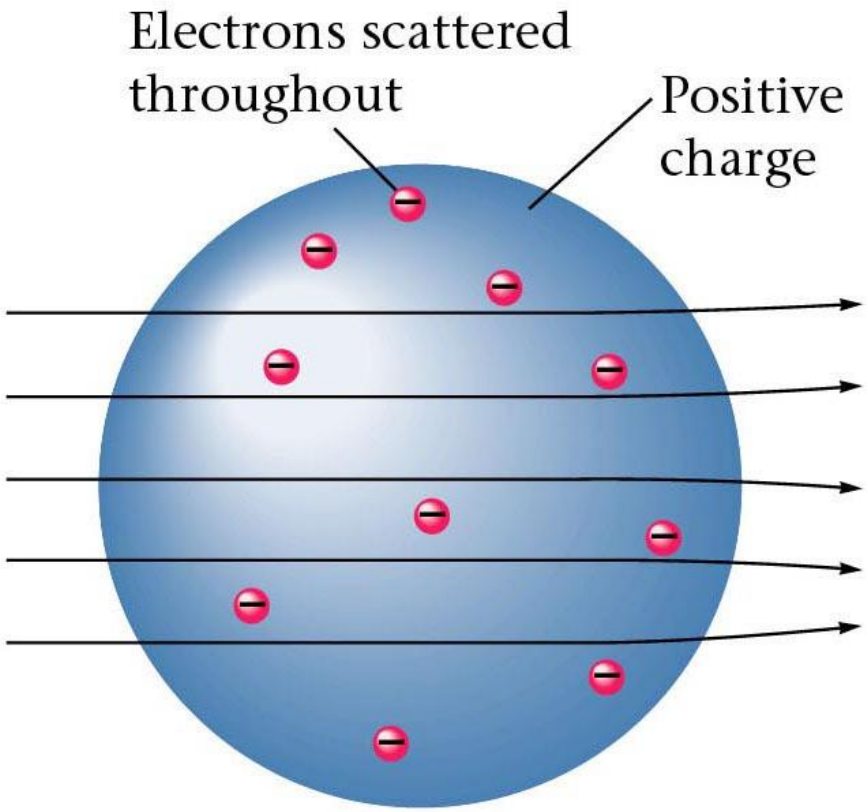
1910

Ernest Rutherford

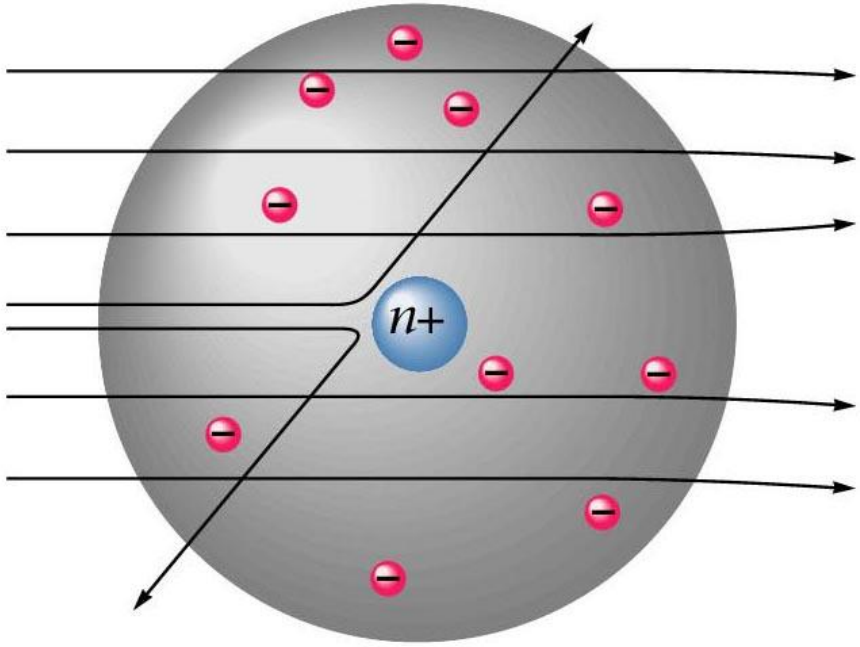
Rutherford's experiment



HISTORY OF THE ATOM

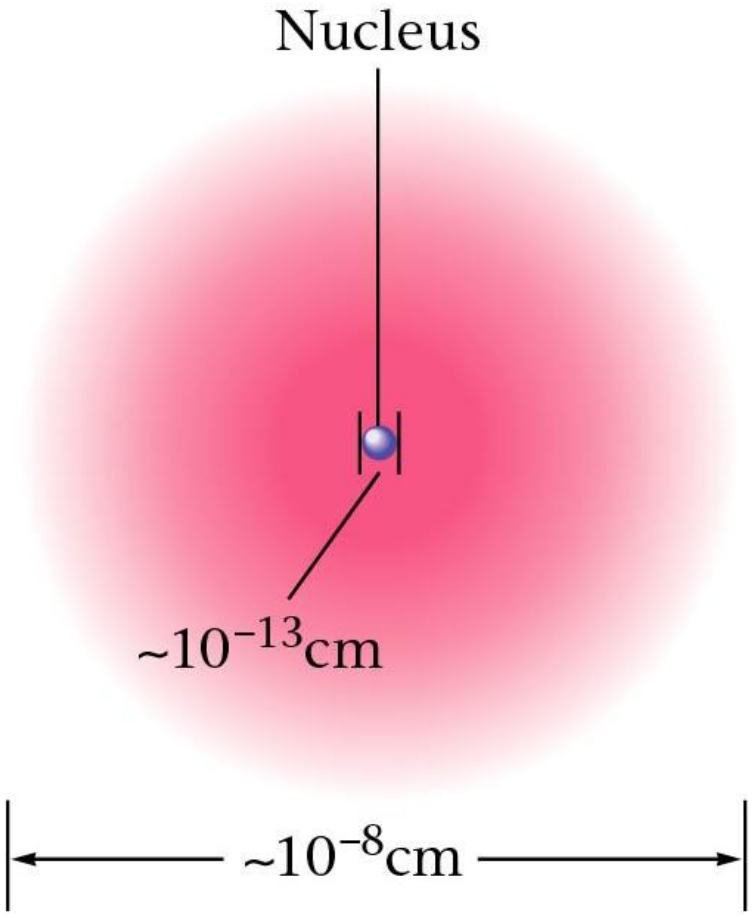


Results of foil experiment if Thompson's model of the atom had been correct.

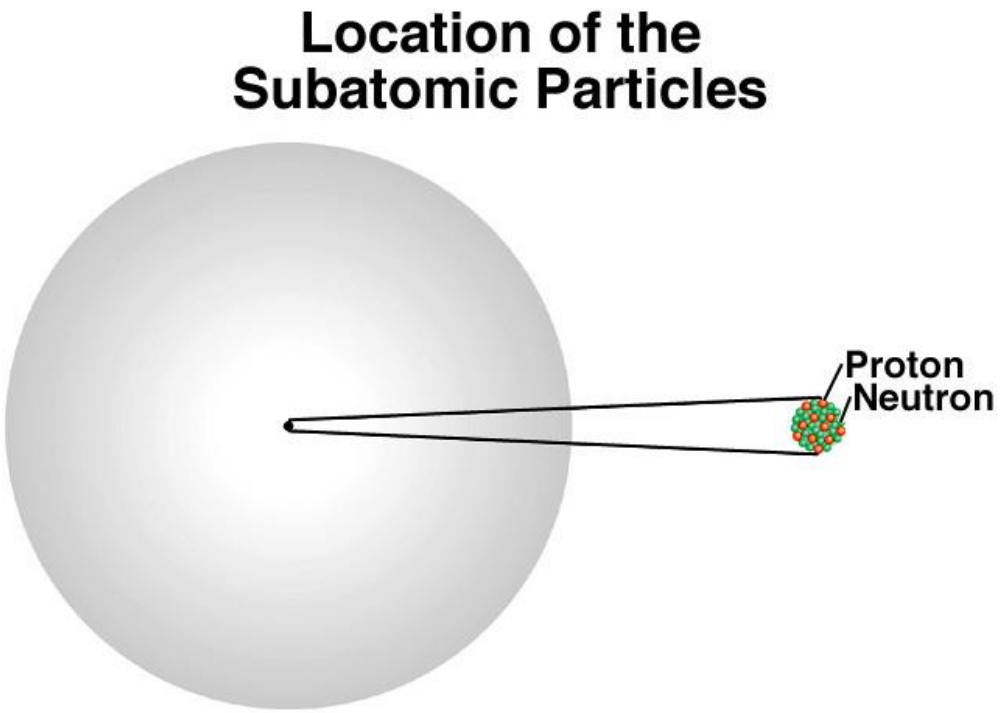


Actual Results

HISTORY OF THE ATOM



A nuclear atom viewed in cross section.



Rutherford's Model of the Atom

SUBATOMIC PARTICLES

Particle	Mass (g)	Charge (Coulombs)	Charge (units)
Electron (e^-)	9.1×10^{-28}	-1.6×10^{-19}	-1
Proton (p)	1.67×10^{-24}	$+1.6 \times 10^{-19}$	+1
Neutron (n)	1.67×10^{-24}	0	0

mass p = mass n = 1840 x mass e^-

ATOMIC STRUCTURE

- Every different atom has a characteristic number of protons in the nucleus.

  atomic number = number of protons

- Atoms with the same atomic number have the same chemical properties and belong to the same element
- Each proton and neutron has a mass of approximately 1 dalton.
- The sum of protons and neutrons is the atom's atomic mass.
- Isotopes – atoms of the same element that have different atomic mass numbers due to different numbers of neutrons.

ATOMIC STRUCTURE

ATOMIC NUMBER (Z) = number of protons in nucleus

MASS NUMBER (A) = number of protons + number of neutrons

= atomic number (Z) + number of neutrons

ISOTOPS are atoms of the same element (X) with different numbers of neutrons in the nucleus

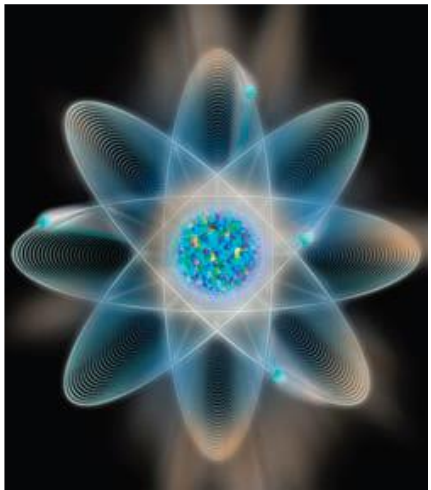
HISTORY OF THE ATOM

1913

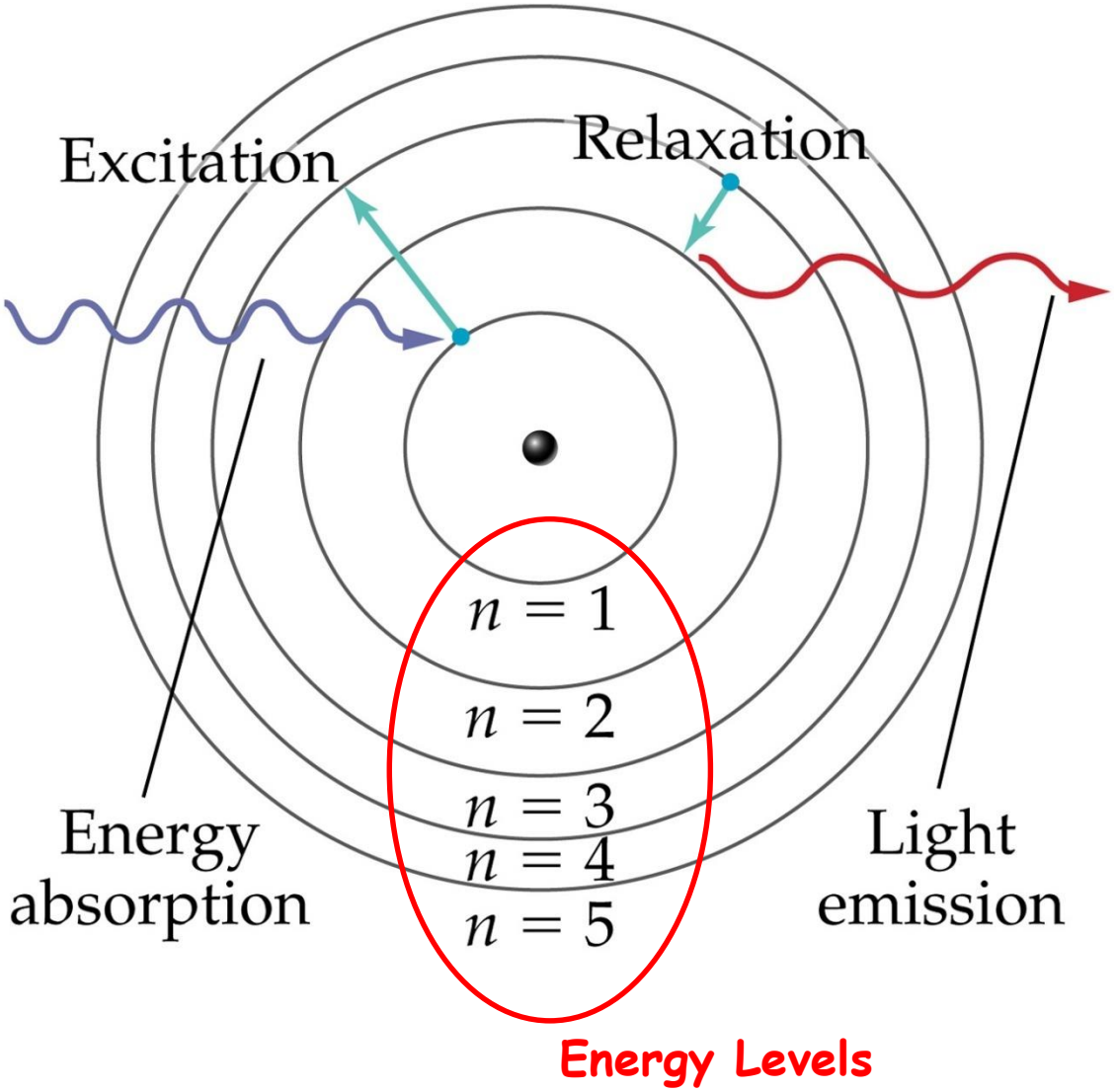
Niels Bohr

studied under Rutherford at the Victoria University in Manchester.

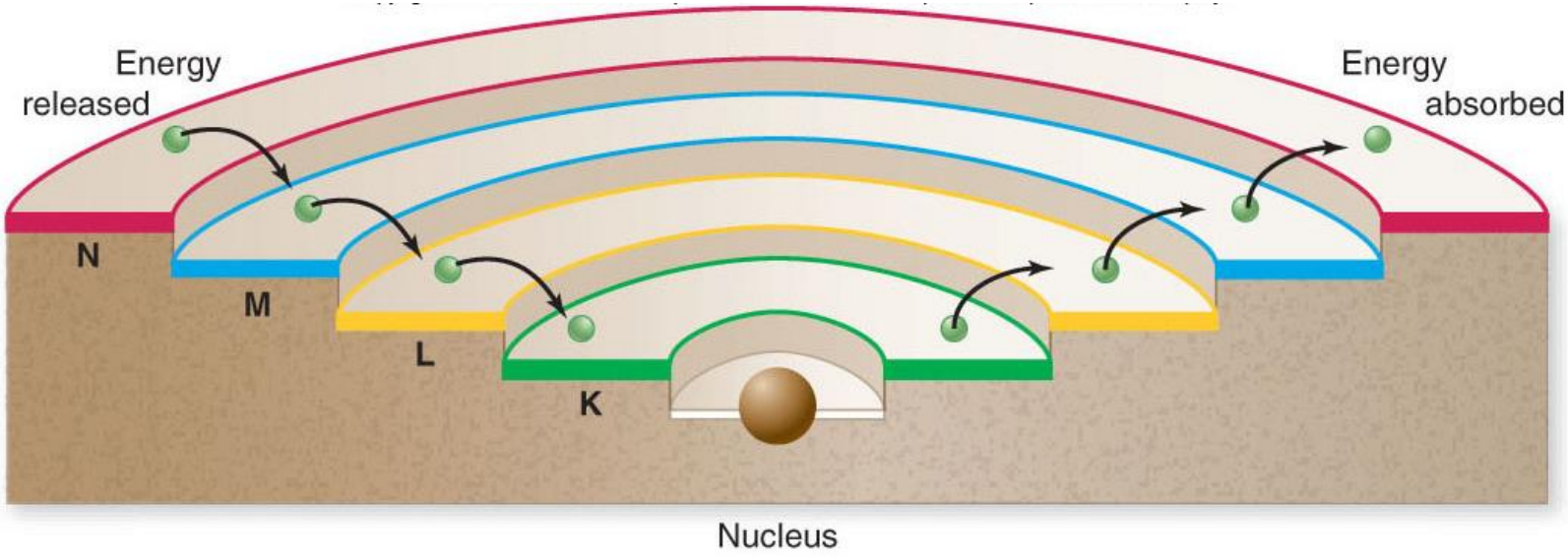
Bohr refined Rutherford's idea by adding that the electrons were in orbits. Rather like planets orbiting the sun. With each orbit only able to contain a set number of electrons.

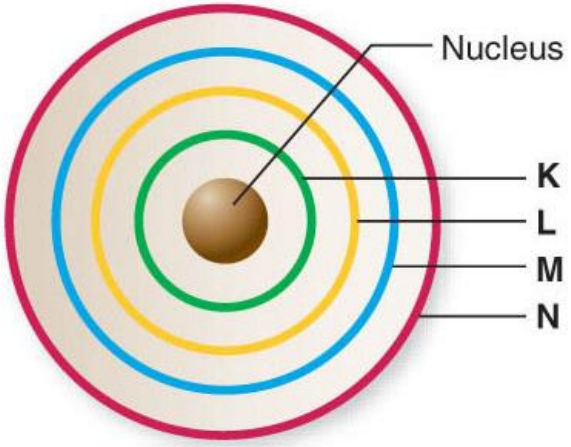


THE BOHR MODEL OF THE ATOM

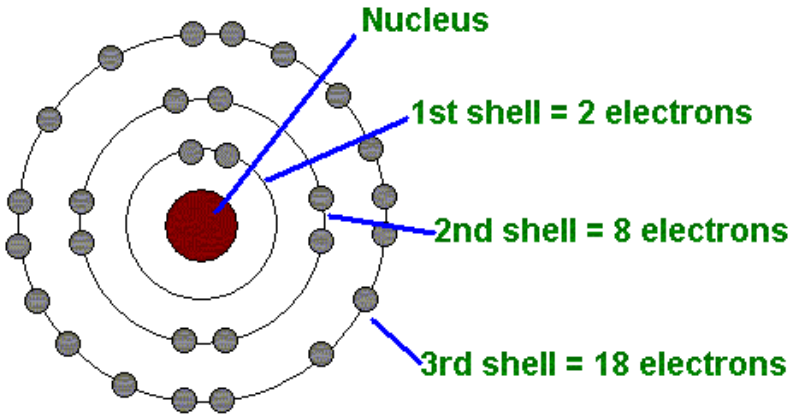


THE BOHR MODEL OF THE ATOM





ENERGY LEVELS & SUBLEVELS

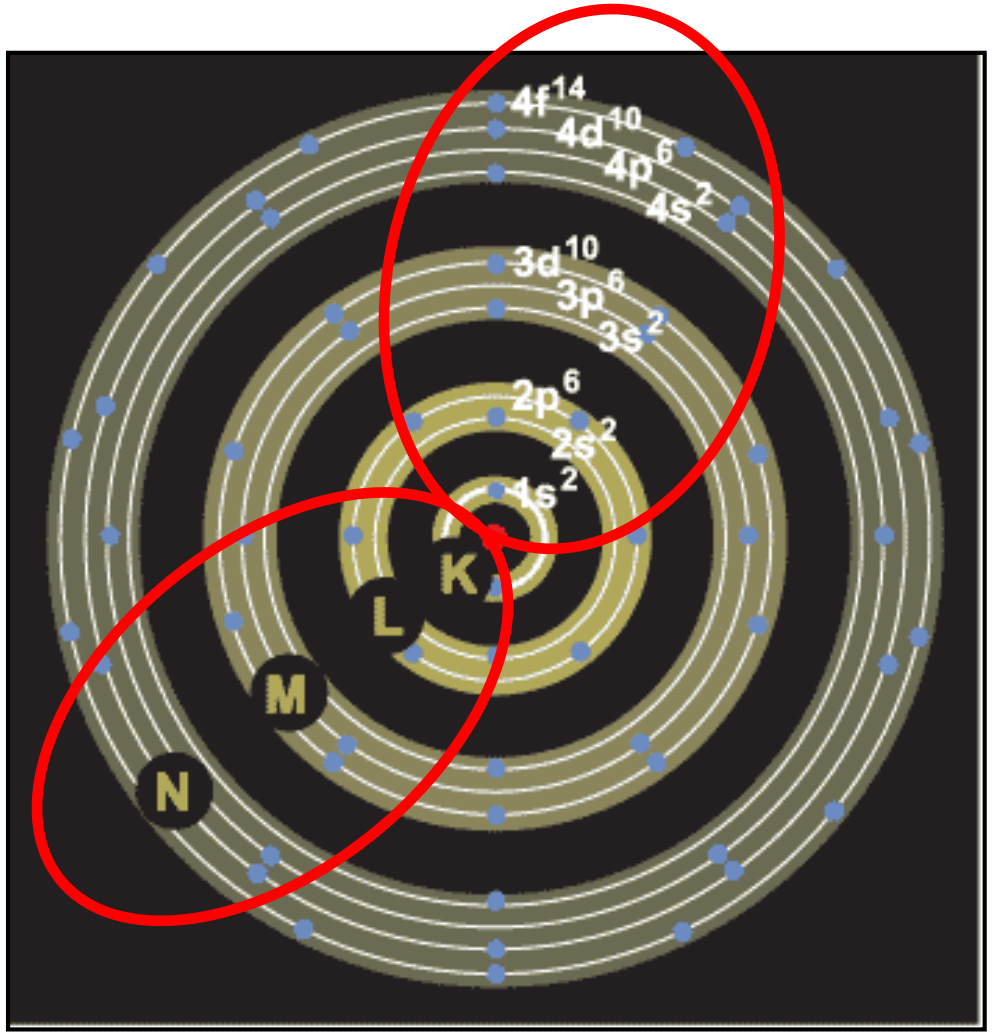


Maximum number of electrons

$2n^2$

n	Sublevels
1	s
2	s, p
3	s, p, d,
4	s, p, d, f

Energy Sublevels



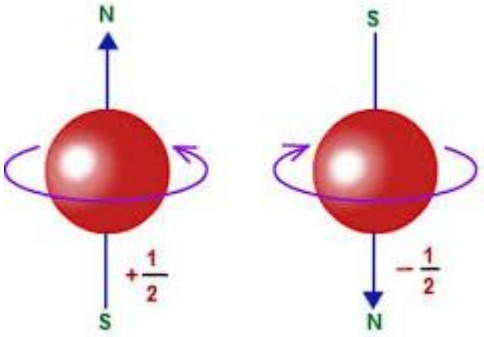
Energy Levels

ORBITALS

Within each sublevel, there are orbitals. This is the final location where the electrons reside

Sublevel	Number of Orbitals	Maximum Number of Electrons
s	1	2
p	3	6
d	5	10
f	7	14

A maximum of 2 electrons can occupy an orbital



ENERGY LEVEL → SUBLEVEL → ORBITAL

ELECTRON CONFIGURATION

Electron configurations tells us in which orbitals the electrons for an element are located.

Three rules:

1. electrons fill orbitals starting with lowest n and moving upwards;
2. no two electrons can fill one orbital with the same spin (Pauli);
3. for degenerate orbitals, electrons fill each orbital singly before any orbital gets a second electron (Hund's rule).

ELECTRON CONFIGURATION

1s

2s 2p

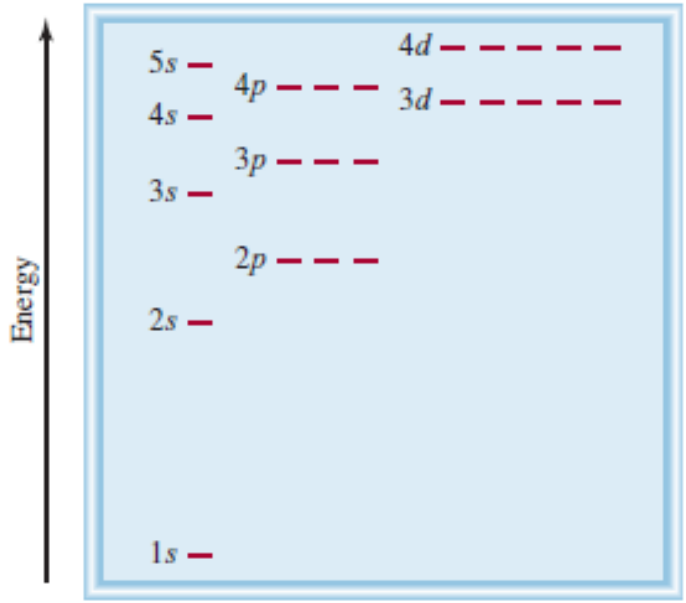
3s 3p 3d

4s 4p 4d 4f

5s 5p 5d 5f

6s 6p 6d

7s 7p



Do not exist in normal ground state atoms

QUESTION

Determine the electron configuration of each element below