

Chemistry

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Ch-4

The structure of atoms and chemical bonding

Atom- an atom is the smallest particle of an element that exhibits all the properties of that element.

Discovery and Features of Subatomic Particles

The discovery of the three basic subatomic particles and some of their important features are discussed in this subsection.

Protons

Protons and Neutrons together make up the nucleus of an atom and are hence called nucleons. Some important points regarding the discovery and properties of protons are listed below.

- Protons are positively charged subatomic particles.
- The number of protons in an atom is equal to the number of electrons in it.
- The discovery of protons is credited to Ernest Rutherford.
- Protons can be produced via the removal of an electron from a hydrogen atom.
- The mass of a proton is 1.676×10^{-24} grams.
- The charge of a proton is $+1.602 \times 10^{-19}$ Coulombs.

Electrons

Electrons are the subatomic particles that revolve around the nucleus of an atom. These electrons may be removed from or gained by an atom to form ions. Electrons of different atoms come together to participate in chemical bonding. A few points detailing the discovery and the properties of electrons are listed below.

- Electrons are negatively charged subatomic particles
- An equal number of electrons and protons are found in the atoms of all elements.

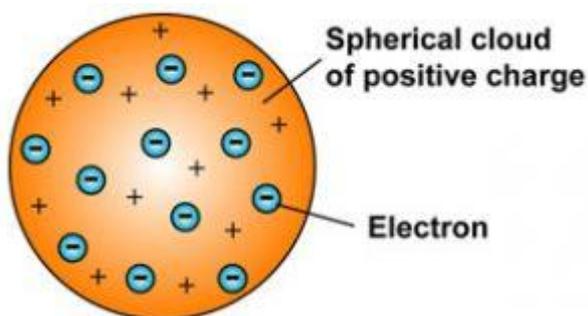
- J. Thompson is credited with the discovery of electrons since he was the first person to accurately calculate the mass and the charge on an electron.
- The mass of an electron is negligible when compared to the mass of a proton. It is found to have a mass equal to $(1/1837)$ times the mass of a proton.
- The charge of an electron is equal to $-1.602 * 10^{-19}$ Coulombs.

Neutrons

Neutrons, along with protons, make up the nucleons. Neutrons are named for their neutral nature – unlike protons and electrons, they do not carry any charge. The discovery and general properties of neutrons are discussed below.

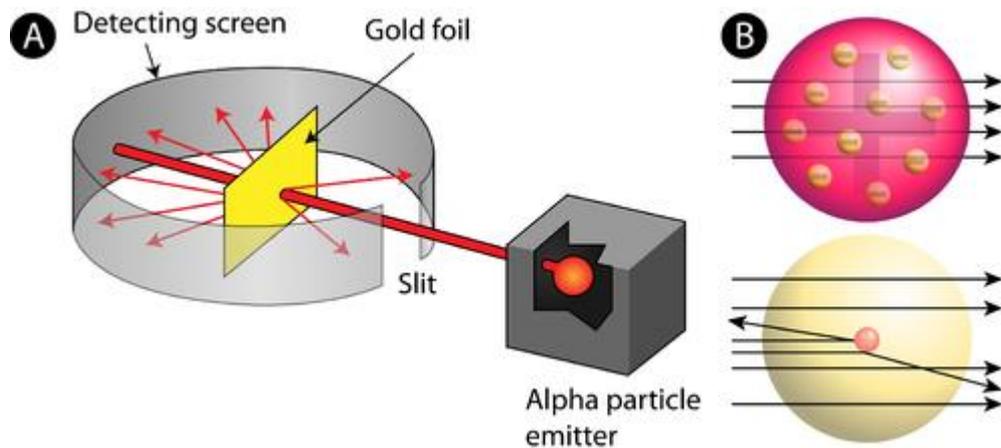
- Neutrons are neutrally charged subatomic particles.
- The masses of two different isotopes of an element vary due to the difference in the number of neutrons in their respective nuclei.
- The neutron was discovered by James Chadwick in the year 1932.
- They were discovered in an experiment wherein a thin sheet of beryllium was bombarded with alpha particles.
- The mass of a neutron is $1.676 * 10^{-24}$ grams

j.j. Thomson atomic model



Plum pudding model of an atom

RUTHERFORD MODEL AFTER ITS ALPHA PARTICLE SCATTERING EXPERIMENT



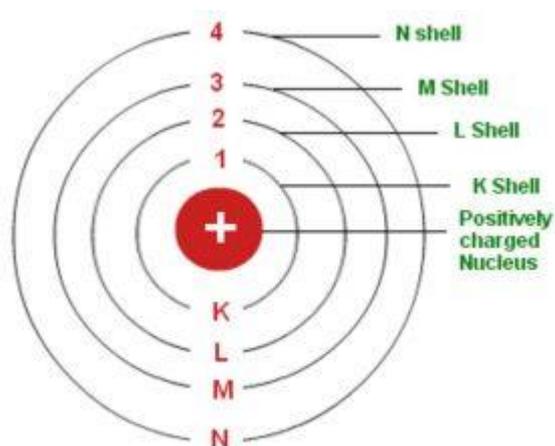
OBSERVATIONS

- Most of the alpha particles passed straight through the gold foil
- Some alpha particles were slightly deflected from their path.
- Very few were either deflected by very large angle or completely bounced back

CONCLUSIONS

- The atom contain large empty space
- There is positively charged mass at the centre of the atom
- That positively charged mass is nucleus
- An atom as a whole is electrically neutral

NEIL BHOR'S ATOMIC MODEL



- Electrons revolve around the nucleus in fixed orbits
- Each orbit has fixed energy level
- While revolving in orbit electrons may gain or lose energy and jump to another energy level

ATOMIC NUMBER- the no. of electrons or protons present in an atom

MASS NUMBER- Total no. of proton and neutron present in the nucleus of an atom.

ORBITAL DIAGRAMS

The electronic structure of the first 20 elements of the periodic table

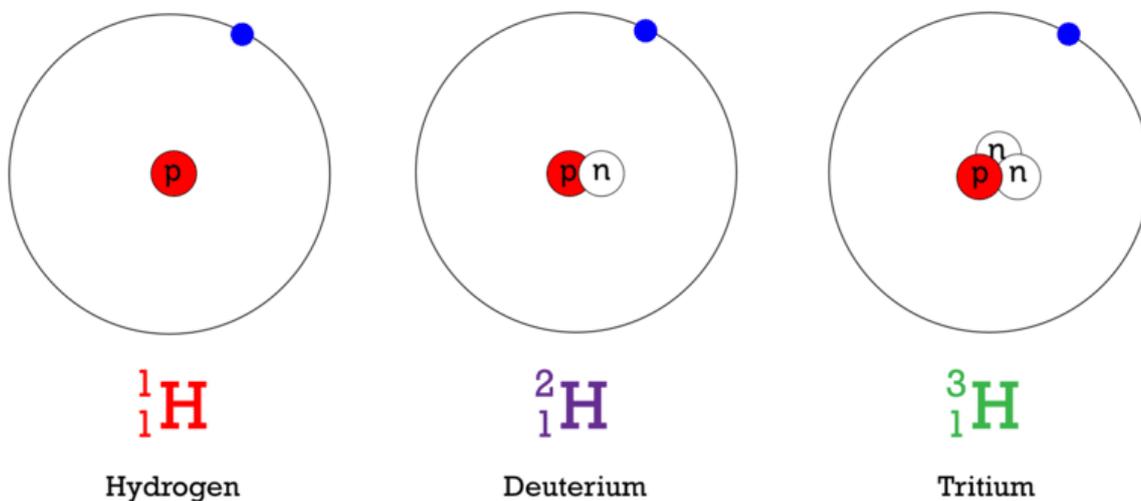
Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
H 1	He 2						Ne 10
Li 3	Be 4	B 5	C 6	N 7	O 8	F 9	Ne 10
Na 11	Mg 12	Al 13	Si 14	P 15	S 16	Cl 17	Ar 18
K 19	Ca 20	no elements here					

● nucleus ● electron chemical symbol and atomic/proton number

this gap is filled with the series of transition metals

ISOTOPES

Atom of the same element having same atomic no. but different mass number.

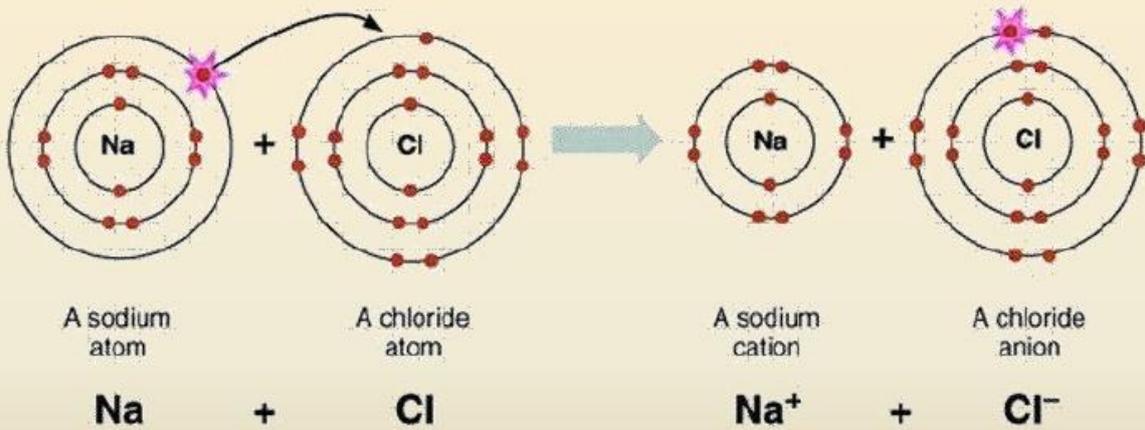


ISOBARS- Atoms of different elements with the same mass no. and different atomic no.

Electrovalent bonding ionic bonding

The chemical compound formed as a result of the transfer of electrons from one atom of an element to another element.

Ionic Bonding



COVALENT BONDING

THE chemical bond that is formed between two combining atoms by mutual sharing of one or more pair of electron is called covalent bonding.

