Science Class 9 Notes – Structure of Atom

1. Sub-Atomic Particles

- **Electrons:** Electron was discovered in cath¬ode ray experiment.
- The term electron was coined by GJ Stoney
- **Protons** were discovered in anode ray ex-periment. Anode rays are also called posi¬tive rays or canal rays. Protons was discovered by Wilhelm Wien in 1902. It was identified by J.J. Thomson.
- Neutron was discovered by James Chadwick in 1932.

2. Atomic Models :

Models are the ideas about how things behave the way they do.

Various Models of atom

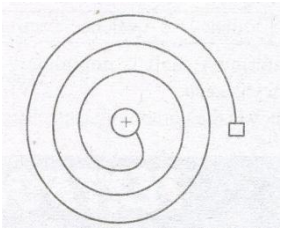
(a) Thomson Model or Water Melon Model or Plum pudding Model

According to this model electrons are embedded in the positively charged mass distributed uniformly throughout the atomic sphere.
This model was proposed by Joseph James Thomson in 1897. This model is also know as apple pie model.

(b) Rutherford's Model or Planetary Model:

This model is based on experiments conducted by Rutherford. This model was given by Ernest Rutherford in 1911.

- According to this model all the positively charged particles are present in a small space in the centre of the atom. This small space is called nucleus.
- The electrons revolve around the nucleus just as the planets revolve around the sun. Due to this similarity, Rutherford's model is called the planetary model or Solar model.
- Electrons (negatively charged) revolve around the nucleus in orbits with a high speed to overcome the elecro-static force of attraction between positively charged particles (protons) present in the nucleus.



Drawbacks of Rutherford's Model

The two deficiencies of this model are:

- It is possible to have infinite number of orbits. In practice it is not the case.
- The moving electron must continuously lose energy and fall into the nucleus. Actually it is not the case.

(c) Bohr's Atomic Model: This model was given by Neils Bohr in 1913. According to this model.

- an atom consists of heavy positively charged nucleus. The whole mass of the atom is concentrated in the nucleus.
- The electrons in an atom revolve around the nucleus in definite circular paths called orbits or energy level.
- Each energy level is associated with definite amount of energy.
- The change in energy takes place when electron jumps from one energy level to another energy level.

3. Arrangement of electrons in an atom : The arrangement of electrons in various shells (energy levels) of an atom of the element is known as Electronic configuration.

The Maximum number of electrons that could be put in a particular shell (i.e., energy levels was given by Bohr and Bury.
According to Bohr-Bury Scheme

- The maximum number of electrons that can be accommodated in any energy level is given by $2n^2$ where 11 = 1, 2, 3, 4, …. (for K, L, M, N…..)
- The maximum number of electrons in the outermost orbit will be 8 electrons even if it has capacity to accommodate more electrons.
- Electrons, are not accommodated in a given shell. Unless earlier shells are filled, that is stepwise filling of shells is followed.

4. Valency : The electrons present in the outer most shell of an atom are known as valence electrons. These electrons determine the valency of an atom.

Valency is equal to the number of valence electrons.

In case the number of valence electrons is close to its full capacity. Then,
Valency =8— valence electrons

If outermost shell is completely filled then 9. valency is zero.

Valency is the combining capacity of an atom.

5. Atomic number (Z) : Atomic number of an element is equal to the number of protons present in the nucleus of an atom.

Atomic number (z) = number of protons = number of electrons.

6. Mass number (A) : It refers to the total num¬ber of neutrons and protons, (i.e., sum of pro¬tons and neutrons) called collectively as nucleus, present in an atom.

Mass number (A) = number of protons + number of neutron = number of nucleus

7. Isotopes : Atoms of the same element having same atomic number but different mass num bers are known as Isotopes eg.

$^{35}_{17}Cl$ and $^{36}_{17}Cl$, $^{1}_{1}H$ and $^{2}_{1}H$, $^{12}_{6}C$ and $^{14}_{6}C$ etc.

8. Applications of Isotopes : Isotopes are used in, various fields. For example.

- Isotope of uranium is used as a fuel in nuclear reactor
- Isotope of cobalt is used in treatment of cancer
- Isotope of iodine is used in treatment of goitre.

9. Isobars : Atoms of different elements having same mass numbers are known as Isobars, e.g K-40 and Ar-40