SUBJECT - CHEMISTRY
CLASS - BSc (Sub./Hon) PART - I
GROUP - B
TOPIC - BOHR'S MODEL OF ATOM.

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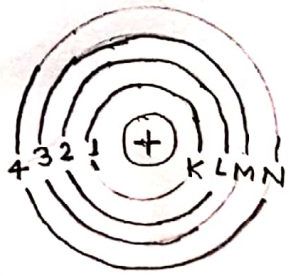
Bohr's Theory (or model) of atom: This theory is based on the famous planck's quantum theory and Rutherford's nuclear theory. It is Similar to Rutherford's model with respect to the Structure of the nucleus but it differs from the latter in that electrons move around The nucleus. following are the main points of this theory:

(1) Electrons are Continuously patrolling round the nucleus in a certain closed circular path known as orbit/shell. The electron present in the certain shell is associated with a definite amount of energy. So, Shells are also called energy levels. The orbit are stationary. The Shells are denoted by the letter K, L, M... Counting outwards from the nucleus and these are also numbered 1, 2, 3... respectively because Shells are placed one above The other around the nucleus.

The number is also called as principal quantum number or Simply 'n'



(2) There are a number of orbits but electron can move only in Such orbits in which the angular momentum of an electron is $\frac{nh}{2\pi}$ where n = orbit number and h = planck's Constant (6.625×10^{-34} Js) If r be the distance from the axis of rotation of the electron having mass m and velocity V, then

$$mvr = \frac{nh}{2\pi}$$

This is also called quantisation of angular momentum. Quantisation means that a quantity does not vary continuously.

(3) So long as electron keeps on moving in a particular orbit, it does not emit any electromagnetic radiation.

(4) Whenever electron jumps from inner to outer orbits, there is absorption (or gain) in energy, but if it jumps from outer to inner orbits, there is emission (or loss) of energy. This loss or gain in energy of electron is always expressed in special unit of energy. quantum (hν). Therefore, the jump of electron from one orbit to another is always followed by emission or absorption of radiation of a definite frequency, thus producing a definite spectral line.

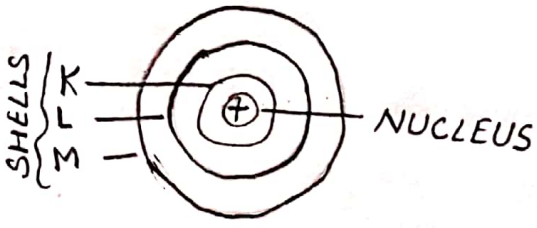
(5) The maximum number of electron in an orbit is $2n^2$, where n = orbit number.

(6) Bohr also calculated the energy of electron (E) and radius (or size) of orbit (r)

$$E = -2.18 \times 10^{-18} \times Z^2/n^2 \text{ Joule}$$

and $r = 0.529 \times 10^{-10} \times n^2/Z$ metre. where Z = at. no.

on the basis of above postulates, Bohr's picture of atom can be drawn as



This theory has now been superced by the application of wave mechanics which has shown that for the H-atom spectrum, Bohr's theory is a very good approximation. wave mechanics has the advantage of requiring no adhoc assumptions and deals more effectively with the problem of atoms with two or more electrons.