Class : IX

Subject : CHEMISTRY

Chapter : 4 STRUCTURE OF THE ATOM

Solution1.

The radiations that are positively charged are canal rays. This discovery was crucial in the discovery of another subatomic particle that was positively charged – the proton.

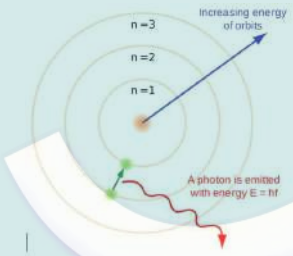
Solution 2.

As per Thompson's model of an atom,

i) An atom contains a positively charged sphere in which the negatively charged electrons are implanted.
ii) Electrons and protons are equal in magnitude; hence, an atom, on the whole, is electrically neutral.

Solution 3.

- An atom holds the nucleus at the centre.
- Negatively charged electrons revolve around the nucleus.
- The atoms in it contain distinct orbits of electrons.
- Electrons do not radiate energy when they are in their orbits.
- The distinct orbits are named K, L, M, and N orbits. Numbers used to denote them are n=1, 2, 3.



Solution4.

The following are the limitations of Rutherford's model of the atom:

- There is no expected stability in the revolution of the electron in a circular orbit.
- Charged particles radiate energy when accelerated, thus causing the revolving electrons to lose energy and would fall into the nucleus.
- Hence, atoms must be highly unstable. The matter would not exist in its known form, which clearly is an assumption as atoms are highly stable.

Solution 5.

- An isotope of carbon-12, C14, is used in carbon dating.
- U235 is used in the nuclear reactors to generate electricity.

Solution 6.

(a) Isotopes: Isotopes are atoms which have the same number of protons, but the number of neutrons differs. This leads to the variation in mass number too.
Example: Carbon molecule exists as 6C12 and 6C14, but when their electronic configuration is noticed, both have K-2; L-4

(b) Isobars: Isobars are atoms which have the same mass number but differ in atomic number. The electronic configuration of an isobar pair is as follows:

(c) Example: Electronic configuration of 20Ca40 – K-2; L-8; M-8; N- 2
Electronic configuration of 18Ar40 – K-2; L-8; M-8

Solution 7.

The following are the limitations of J.J. Thomson's model of an atom:

i) The model failed to explain the outcome of alpha particle scattering, which was conducted by Rutherford. The model failed to depict why the majority of these alpha particles pass through the gold foil, while some diverted through small and big angles, while some others rebound completely, returning on their path.

ii) It did not provide any experimental evidence and was established on imagination.

Solution 8.

The atomic number of sodium is 11. It has 11 electrons in its orbitals, wherein the number of protons is equal to the number of electrons. Hence, its electronic configuration is K-2 ; L-8 ; M-1 ; The one electron in the M shell is lost, and it obtains a positive charge since it has one more proton than electrons and obtains a positive charge, Na+ . The new electronic configuration is K-1; L-8, which is the filled state. Hence, it is very difficult to eliminate the electron from a filled state as it is very stable.

Solution 9.

Since a proton is a positively charged particle and an electron is a negatively charged particle, the net charge becomes neutral as both particles neutralise each other.

Solution10.

In the $\propto$ – particle scattering experiment, when any other metal foil is used instead of gold, the observation would remain the same. This is because the structure of an atom, when considered individually, remains the same.