

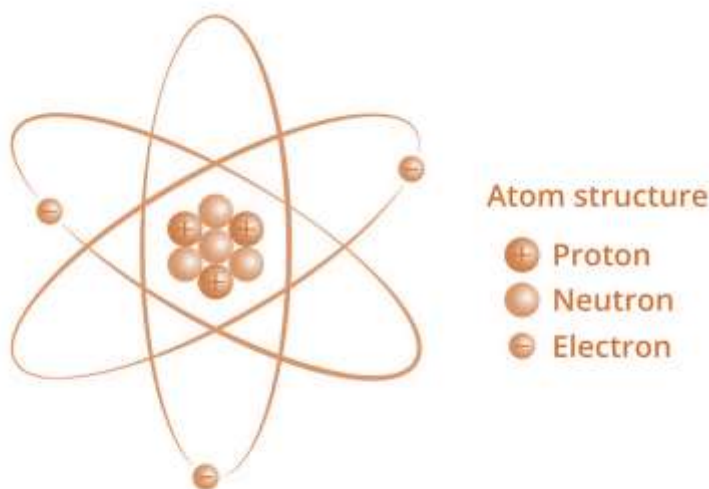
## Structure of Atoms

Atoms consist of three basic particles: protons, electrons, and neutrons. The nucleus (center) of the atom contains the protons (positively charged), and the neutrons (no charge). The outermost regions of the atoms are called electron shells and contains electrons (negatively charged).

**Electron:-** The electron is a subatomic particle, symbol  $e$ , whose electric charge is negative one elementary charge. They are known as elementary particles because they have no known components or substructures. The electrons have a mass that is approximately  $1/1836$  that of a proton.

**Proton:-** A proton is a subatomic particle, symbol  $p$ , with a positive electric charge of  $+1e$  elementary and a mass slightly less than of a neutron. Protons and neutrons, each with masses of approximately one atomic mass unit, are collectively referred to as nucleons (particles present in the nucleus).

**Neutron:-** The neutron is a subatomic particle, symbol  $n$ , with no net electric charge and a mass slightly greater than that of a proton. Protons and neutrons constitute the nuclei of atoms. Since protons and neutrons behave similarly within the nucleus, and each has a mass of approximately one atomic mass unit, they both are referred to as nucleons.



**Valency:-** It is the ability of an atom to gain or lose an electron in order to achieve the noble gas configuration. It refers to the ability to combine with other elements. It is obtained by determining the number of electrons in the outermost shell (also called valence shell) of each atom of an element. For instance sodium has 1 electron in the outermost shell and hence valency of sodium is 1.

| ELEMENTS   | SYMBOLS | ATOMIC NUMBER | VALENCY |
|------------|---------|---------------|---------|
| Hydrogen   | H       | 1             | 1       |
| Helium     | He      | 2             | 0       |
| Lithium    | Li      | 3             | 1       |
| Beryllium  | Be      | 4             | 2       |
| Boron      | B       | 5             | 3       |
| Carbon     | C       | 6             | 4       |
| Nitrogen   | N       | 7             | 3       |
| Oxygen     | O       | 8             | 2       |
| Fluorine   | F       | 9             | 1       |
| Neon       | Ne      | 10            | 0       |
| Sodium     | Na      | 11            | 1       |
| Magnesium  | Mg      | 12            | 2       |
| Aluminium  | Al      | 13            | 3       |
| Silicon    | Si      | 14            | 4       |
| Phosphorus | P       | 15            | 3       |
| Sulphur    | S       | 16            | 2       |
| Chlorine   | Cl      | 17            | 1       |
| Argon      | Ar      | 18            | 0       |
| Potassium  | K       | 19            | 1       |
| Calcium    | Ca      | 20            | 2       |

**Isotopes:-** Isotopes are variants of a particular chemical element that differ in neutron number, and consequently in nucleon number. All isotopes of a given element have the same number of protons but different numbers in each atom.

Example:- Carbon -12, carbon-13, carbon-14 are three isotopes of carbon with mass numbers 12, 13, 14.

**Isobars:-** Isobars are atoms of different chemical elements that have the same number of nucleons. Correspondingly, isobars differ in atomic number but have the same mass number.

Example:-  $^{40}\text{S}$ ,  $^{40}\text{Cl}$ ,  $^{40}\text{Ar}$ ,  $^{40}\text{K}$  and  $^{40}\text{Ca}$  while the nuclei of these atoms contain 40 nucleons, they contain varying numbers of protons and neutrons.

