ATOMIC STRUCTURE

CS (Section- B)

03-03-2021 (4th Period)

Atom: An atom is the smallest particle of an element that participates in chemical combinations i.e. in chemical bond formations.

Sub-atomic Particles of Atom: An atom consists of several elementary particles such as electron, proton, neutron, positron, meson, neutrino, antineutrino etc. These elementary particles are called sub-atomic particles.

Fundamental particles of atom: The total mass and total charge of the atom depends upon three elementary particles electro, proton and neutron. These three particles are the major component of any atom and are called as fundamental particles of atom.

Characteristics of fundamental particles of atom: The characteristics of fundamental particles of atom can be summarized as below.

	Electron	**Proton**	**Neutron**
Discoverer	J. J. Thomson	Eugen Goldstein	James Chadwick
Symbol	e, $_{-1}e^{0}$	p, $_{1}p^{1}$, H^{+}	n, $_{0}n^{1}$
Location	In orbits outside the nucleus	In the nucleus	In the nucleus
Relative Charge	-1 unit	+1 unit	Charge less or Neutral
Absolute Charge	-4.8×10^{-10} esu (CGS) -1.6×10^{-19} C (SI)	$+4.8 \times 10^{-10}$ esu (CGS) $+1.6 \times 10^{-19}$ C (SI)	0
Relative Mass	1/1837 amu or 0.00055 amu	1 amu, or 1.00728 amu	1 amu, or 1.00866 amu
Absolute Mass	9.109×10^{-28} g or 9.109×10^{-31} kg	1.673×10^{-24} g or 1.673×10^{-27} kg	1.673×10^{-24} g or 1.673×10^{-27} kg

Atomic Number (Z): The total number of protons present in the nucleus of an atom is called atomic number and is designated by Z. i.e.

Atomic Number = Number of protons in the nucleus.

or $Z = p$

For a neutral atom,

Number of protons = Number of electrons

or $p = e$

Therefore,

Atomic Number = Number of protons in the nucleus.

= Number of electrons

or $\boxed{Z = p = e}$

Mass Number (A): The total number of protons and neutrons present in the nucleus of an atom is called mass number. In other words the total number of nucleons is called mass number. Mass number is always a whole number and is different from atomic mass. It is designated by 'A'. i.e.,

Mass No. = Total number of nucleons

or Mass number = (Total number of protons + Total number of neutrons)

or $A = p + n$

also, Total No. of protons = Atomic number (Z)

Therefore,

$$\boxed{A = Z + n}$$

Representation of an Atom: An atom is generally represented as ${}^{A}_{Z}X$ or ${}_{Z}X^{A}$.

where,

Z = Atomic number = Total number of protons

A = Mass No. = Total No. of protons and neutrons

X = Symbol of the element

Thus, carbon atom having atomic number 6 and mass number 12 can be represented as ${}^{12}_{6}C$ or ${}_{6}C^{12}$.