

CHEMISTRY STUDY MATERIALS FOR CLASS 9

(BASED ON CHAPTER 3: ATOMS AND MOLECULES)

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Atom:-An atom is a particle of matter that uniquely defines a chemical element.

An atom consists of a central nucleus that is usually surrounded by one or more electrons. Each electron is negatively charged. The nucleus is positively charged, and contains one or more relatively heavy particles known as **protons** and **neutrons**.

Proton (${}_{+1}p^1$) :- The positively charged sub-atomic / fundamental particle present in nucleus of an atom or ion is called proton. It is denoted by "p". The charge of an proton is $+1.67 \times 10^{-19}$ C. The mass of a proton is 1.65×10^{-27} kg. The mass of a proton is 1.0078 u. The number of protons in the nucleus of an atom is the **atomic number** for the chemical element.

Neutron (${}_0n^1$) :- The neutral sub-atomic / fundamental particle present in nucleus of an atom or ion is called neutron. It is denoted by "n". The charge of an electron is zero. The mass of a neutron is 1.67×10^{-27} kg. . The mass of a neutron is 1.0083 u. The neutron is heavier subatomic particles.

Electron (${}_{-1}e^0$) :- the negatively charged sub-atomic / fundamental particle present in orbit/shell of an atom or ion is called electron. It is denoted by "e". The charge of an electron is -1.67×10^{-19} C. The mass of an electron is negligible and equivalent to zero and equal to $1/1840^{\text{th}}$ mass of a proton. The mass of an electron is 0.00054 u. The mass of an electron is 9.1×10^{-31} kg.

The mass of a proton or neutron increases when the particle attains extreme speed, for example in a cyclotron or linear accelerator.

The total mass of an atom, including the protons, neutrons and electrons, is the **atomic mass** or **atomic weight**.

Isotopes:- Atoms having the same number of protons, but different numbers of neutrons, represent the same element, but are known as different **isotopes** of that element. The isotope for an element is specified by the sum of the number of protons and neutrons. Examples of different isotopes of an element are carbon 12(the most common, non-radioactive isotope of carbon) and carbon 14 (a less common, radioactive isotope of carbon).

Protons and electrons have equal and opposite charge, and normally an atom has equal numbers of both. Thus, atoms are usually neutral. An **ion** is an atom with extra electrons or with a deficiency of electrons, resulting in its being electrically charged. An ion with extra electrons is negatively charged and is called an **anion**; an ion deficient in electrons is positively charged and is called a **cation**.

Isotones- Nuclei of atoms with the same neutron number. Example: S-36, Cl-37, Ar-38, K-39, Ca-40. These nuclei contain 20 neutrons each, but a different number of protons: sulphur 16, chlorine 17, argon 18, potassium 19 and calcium 20 protons.

Isobars:- Atoms having the same mass numbers, but different atomic numbers, represent the different element. Example: Cp-59 & Ni-59, Ar-40 & Ca-40.
