The amu without the "unifield" prefix is technically an absolute unit based on oxygen, which was replaced in 1961. However, at many places still used the term "amu" but now define it in the same way as u (i.e., based on carbon-12). In this regard, most uses of the terms "atomic mass units" and "amu" today actually refer to unified atomic mass unit. For standardization a specific atomic nucleus (carbon-12 vs oxygen-16) had to be chosen because the average mass of a nucleon depends on the count of the nucleons in the atomic nucleus due to mass defect. This is also why the mass of a proton or neutron by itself is more than (and not equal to) 1u.

The atomic mass unit is not the unit of mass in the atomic units system, which is basically the electron rest mass.

Isotopes, Isobars and Isotones

All atoms having same atomic number (Z) but having different atomic weight (A) are termed as **isotopes**. **For example:** $_{17}Cl^{35}$ *and* $_{17}Cl^{37}$.

Atoms having same atomic weight (A) but different atomic number (Z) i.e. different number of protons are called isobars. **For example:** ^{40}Ar, ^{40}Ca

Atoms having same number of neutrons but different atomic number (Z) or atomic weight (A) are called **isotones**. **For example:** $_6C^{13}$ *and* $_7N^{14}$.

Mole

A mole is the amount of matter that has a mass in grams equal to the atomic mass in amu of the atoms. Thus, a mole of oxygen has a mass of 32 grams.

Avogadro's number (N_{av})

The number of atoms in a mole is called avogadro number. The numerical value of avogadro's number is

$$N_{av} = 6.023 \times 10^{23}$$

1.2 FUNDAMENTAL COMPONENTS OF ATOMS

Matter is composed of tiny particles called **atoms**. These particles can be divided in three groups as stable, unstable and composite particles. The different tiny particles are given in Table 1.1

Table 1.1

Particle	State	Charge	Remarks
Electron	Stable	–e where, $e = 1.602 \times 10^{-19}$C	Carrier of electric current Rest mass $m_o = 9.1 \times 10^{-31}$ kg
Proton	Stable	+e	Mass of proton $m = 1.672 \times 10^{-27}$ kg The protons and the neutron are considered to be two different charge states of the same particle which is called a nucleon.
Neutron	Stable	0	A neutral nuclear particle. Slightly heavier than proton. Mass = 1.675×10^{-27} kg.
Positron	Unstable	+e	Positive counter part of electron. Electron and positron mutually annihilate each other.
Neutrino & antineutrino	Unstable	0	Produced during radio active decay of electrons and positron.
Meson	Unstable	+e	Mass of meson is in between electron and proton. Two types - (i) π-meson, which is heavier (ii) μ-meson, which is light
Deutron	Composite	+e	Heavy isotope of hydrogen with mass about double that of ordinary hydrogen. Useful as bombarding agent.
Alpha (α) Particle	Composite	+2e	Doubly charged helium nucleus.

1.3 ATOMIC MODELS

Dalton's indivisible atom is composed of sub-atomic particles carrying positive and negative charges. Different atomic models were proposed to explain the distributions of these charged partciles in an atom.

1.3.1 Thomson's Atomic Model

J.J. Thomson, proposed that an atom possesses a spherical shape (radius approximately 10^{-10}m) in which the positive charge is uniformly distrubuted. The electrons are embedded into it in such a manner as to give the most stable electrostatic arrangement.