Introduction to Nuclear Physics

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Rutherford found that the atom consists of a tiny nucleus in which its positive charge and nearly all of its mass are concentrated.

The atomic size is of the order of Angstrom unit(10^{-10} m)and the size of nucleus is of the order of femtometer or fermi(10^{-15}m).

The nuclear size is 10^5 smaller than an atom.

Within a nucleus there are neutrons and protons ,where protons have positive charge and neutrons are chargeless

The protons and protons repel each other due to electrostatic force .

But there is a strong nuclear force is present between nucleons which overcome the electrostatic force and form a stable nucleus.

The atomic mass number - A, Proton number(Atomic number)-Z, Neutron number-N

A=Z+N

The number of protons in each of atomic nuclei is the same as the number of electrons in that atom.

Mass of an atom:-Mass of an atom is the sum of mass of protons,mass of neutrons and mass of electrons.

Mass of proton≃Mass of neutron

Mass of electron =l/1836 of mass of proton

Mass of an atom≃Mass of protons+mass of neutrons

Mass of an atom≃mass of nucleus of that atom.

Isotopes:The varieties of an element having same atomic number but differ in the number of neutrons eg:$_1H^1$,$_1H^2$,$_1H^3$

(These are hydrogen isotopes protium,dueterium,and tritium)

No.of protons in all isotopes of an element are same.

Chemical properties of an element are determined by the number and arrangement of electrons in an atom which is equal to the number of protons.

Therefore ,Chemical properties of all isotopes are identical.

Atomic masses are expressed in atomic mass units(amu or simply u)

1amu=1.66054 10^{-27}kg

The atomic mass can be expressed in energy unit also

We have the relation $E=mc^2$

$m=E/c^2$

So the unit of mass is MeV/c^2

fig.