Binding Energy Flow Diagram

Mass of carbon-12 atom

1 atomic mass unit u
= 1/12 of mass of C-12 atom

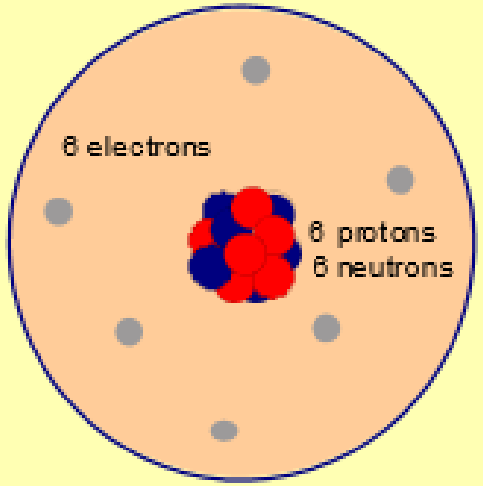
1 u = 1.66056 10^{-27} kg

mass of C-12 atom = 12.0000 u

Mass of 6 electrons

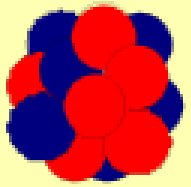
mass of electron
= 9.1095 10^{-31} kg
= 0.000549 u

mass of 6 electrons = 0.0033 u



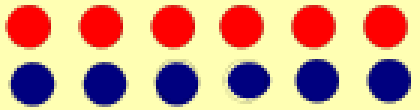
Calculate mass of carbon-12 nucleus

mass of carbon-12 nucleus
= mass of carbon-12 atom
– mass of 6 electrons



mass of carbon-12 nucleus
= (12.000 – 0.0033) u
= **11.9967 u**

Calculate mass of all the protons and neutrons



mass of proton
= 1.67265 10^{-27} kg
= 1.00728 u

mass of neutron
= 1.67495 10^{-27} kg
= 1.00866 u

mass of 6 protons and 6 neutrons
= 6 (1.00728 + 1.00866) u
= **12.0956 u**

Binding energy

in mass units:

= – **0.0989 u**

= – 1.643 10^{-28} kg

$E_{rest} = mc^2$

in energy units:

= – 1.477 10^{-11} J

= – **92.16 MeV**

Binding energy per nucleon

–92.16 MeV for 12 nucleons

= – **7.7 MeV per nucleon**

The binding energy of a nucleus is the difference between its mass and the sum of the masses of its neutrons and protons