Problem-15

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Obtain the binding energy (in MeV) of a nitrogen nucleus ($_7N^{14}$) , given m($_7N^{14}$) = 14.00307 u

Mass of proton = 1.007825 amu
Mass of neutron = 1.008665 amu
1 amu = 931.5 amu

Solution :- Given: nucleus $_7N^{14}$

Mass of 7 protons = $7 \times 1.007825 = 7.054775$ amu

Mass of 7 neutrons = $7 \times 1.008665 = 7.060655$ amu

∴ Total initial mass of 7 protons + 7 neutrons

$= 7.054775 + 7.060655$

$= 14.11543$ amu

∴ Mass Defect $\Delta m = 14.11543 - 14.00307$

$= 0.11236$ amu

∴ Binding energy of $_7N^{14}$ is

$E_b = \Delta m \times c^2$

$= 0.11236 \times 931.5$

$E_b = 104.663364$ MeV

∴ binding energy of $_7N^{14}$ is 104.663364 MeV

For your practice:

① Obtain the binding energy of the nuclei $^{56}_{26}Fe$ and $^{209}_{83}Bi$ in units of MeV.

Given: $m\left(^{56}_{26}Fe\right) = 55.934939\ u$

$m\left(^{209}_{83}Bi\right) = 208.980388\ u$

[Ans. 8.79 MeV & 7.84 MeV]