Worksheet: Nuclear Binding Energy

Q1: An atom of $^{56}_{26}\mathrm{Fe}$ has a mass of 55.9349 u, including electrons. Calculate, to 3 significant figures, the binding energy per nucleon for this nuclide, approximate the answers to 3 significant figures and in MeV.

A 8.35 MeV

B 8.70 MeV

C 7.89 MeV

D 8.79 MeV

E 8.55 MeV

Q2: An atom of $^{19}_{9}\mathrm{F}$ has a mass of 18.9984 u, including electrons. Calculate the binding energy per nucleon for this nuclide, approximate the answers to 3 significant figures and in MeV.

A 7.78 MeV

B 8.39 MeV

C 8.15 MeV

D 7.54 MeV

E 8.66 MeV

Q3: An atom of $^{4}_{2}\mathrm{He}$ has a mass of 4.0026 u, including electrons. Calculate the total binding energy for this nuclide, approximate the answers to 3 significant figures and in MeV.

A 28.3 MeV

B 26.7 MeV

C 27.3 MeV

D 30.4 MeV

E 29.3 MeV

Q4: The total mass of one atom of $^{60}_{28}\mathrm{Ni}$, including electrons, is 59.93079 u. Calculate to 3 significant figures the nuclear binding energy per nucleon in mega-electron volts.

A 8.54 MeV

B 8.74 MeV

C 8.70 MeV

D 8.78 MeV

E 8.50 MeV

Q5: The total mass of one atom of $^{19}_{9}\mathrm{F}$, including electrons, is 18.99840 u. Calculate to 3 significant figures the nuclear binding energy per nucleon in mega-electron volts.

A 7.30 MeV

B 7.78 MeV

C 7.54 MeV

D 8.39 MeV

E 7.10 MeV

Q6: An atom of $^{8}\mathrm{B}$ (mass = 8.0246 u) decays into an atom of $^{8}\mathrm{Be}$ (mass = 8.0053 u) by electron capture. Calculate, to 3 significant figures, the energy released by this reaction. Calculate the total binding energy for this nuclide in MeV.

A 17.5 MeV

B 18.0 MeV

C 16.7 MeV

D 19.3 MeV

E 19.8 MeV

Q7: Helium-4 can be produced by nuclear fusion of lithium-6 with deuterium.

$$^{6}_{3}\mathrm{Li} + ^{2}_{1}\mathrm{H} \longrightarrow 2\,^{4}_{2}\mathrm{He}$$

The atomic masses of lithium-6, deuterium, and helium-4 are 6.01512 u, 2.01410 u, and 4.00260 u respectively. Calculate to 3 significant figures the energy released by this fusion reaction.

A 26.8 MeV

B 22.4 MeV

C 5.92 MeV

D 15.5 MeV

E 1.47 MeV

Q8: The total mass of one atom of $^{3}_{1}\mathrm{H}$, including electrons, is 3.016049 u. Calculate to 3 significant figures the nuclear binding energy per nucleon for this atom.

A 2.37 MeV

B 3.26 MeV

C 3.17 MeV

D 2.65 MeV

E 2.83 MeV