First Name:_____    Last Name:_____

## L11 – FQ – Fission and Fusion

*Use the following information to answer Q1-Q2:*

**Binding Energy per Nucleon**
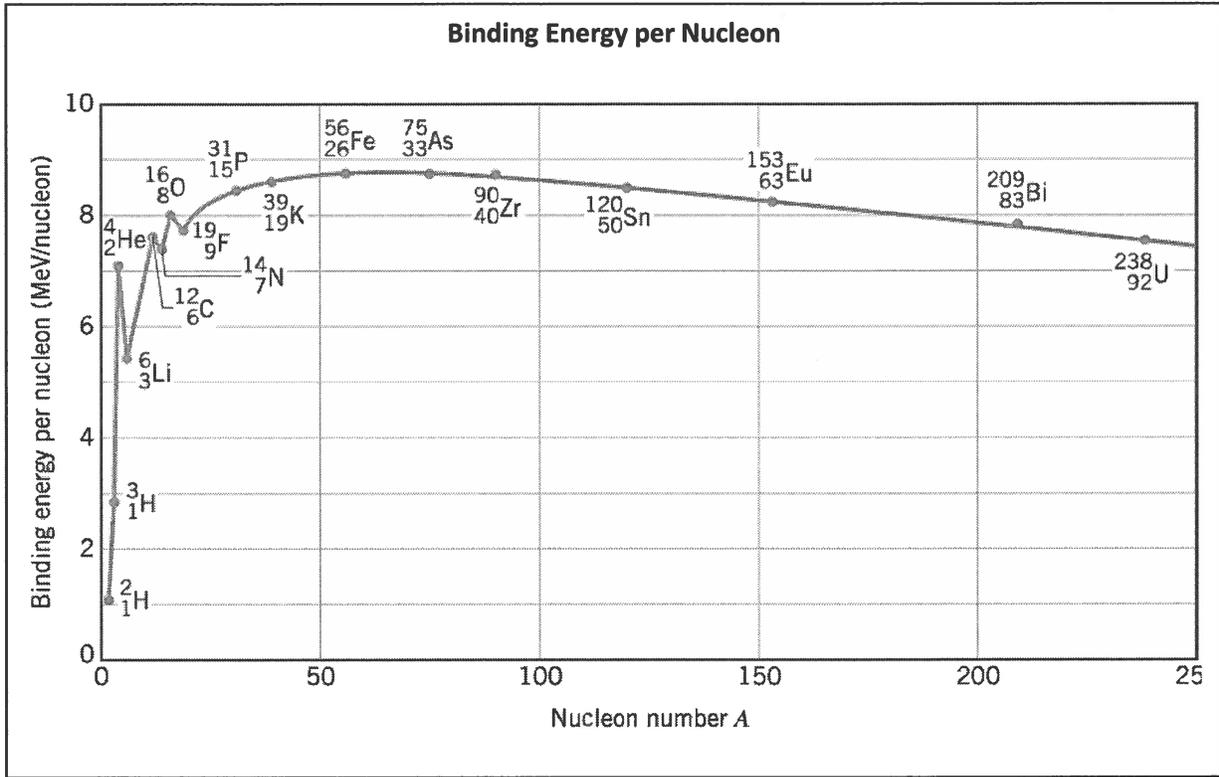


**Q1:** Using the graph above, what is the approximate binding energy per nucleon for Iron-56?

    a.   1.2 MeV
    (b.)  8.8 MeV
    c.   67.2 MeV
    d.  492.8 MeV

**Q2:** Which of the following nuclei is the most tightly bound?

    a.  Hydrogen-2   1 MeV per nucleon
    b.  Lithium-6     5.4 MeV per nucleon
    (c.) Bismuth-209  7.8 MeV per nucleon
    d.  Uranium-238  7.5 MeV per nucleon

**Q3:** Which isotope below has the **highest** nuclear binding energy per nucleon?

a. $^4_2He$      b. $^{32}_{16}S$      (c.) $^{55}_{25}Mn$      d. $^{137}_{56}Ba$

Closest to $^{56}Fe$

**Q4:** Which of the following statements is **incorrect**?

a. Mass defect is the amount of matter that would be converted into energy if a nucleus were formed from initially separated protons and neutrons.
b. Nuclear binding energy is the energy released in the formation of an atom from subatomic particles.
c. Nuclei with the highest binding energies are the most stable nuclei.
(d.) Mass number is the sum of all protons and electrons in an atom.

**Q5:** Which of the following describes what occurs in the fission process?

(a.) A heavy nucleus is fragmented into lighter ones.
b. Two light nuclei are combined into a heavier one. → Fusion
c. A proton is split into three quarks.
d. A particle and anti-particle appear in the area of high energy density.

**Q6:** When $^{235}U$ is bombarded with one neutron, fission occurs and the products are three neutrons, $^{94}Kr$, and which of the following?

(a.) $^{139}Ba$
b. $^{139}Ce$
c. $^{139}Xe$
d. $^{141}Ce$

$$^{235}_{92}U + ^1_0n \rightarrow ^{94}_{36}Kr + ^1_0n + ^1_0n + ^1_0n + ^{139}_{56}Ba$$

Conservation of Nucleons
235 + 1 = 94 + 1 + 1 + 1 + 139
Conservation of Charge
92 + 0 = 36 + 0 + 0 + 0 + 56

**MARKING:**
Beginning     0 - 2
Progressing    3 - 4
Competent     5
Exemplary      6