DPP : PHYSICS – NUCLEAR PHYSICS

1. Which of the following pair of nuclei are isotones?

(a) ${}^{9}_{4}Be, {}^{10}_{5}B$ (b) ${}^{4}_{2}He, {}^{4}_{2}He$

(c) ${}^{17}_{8}O, {}^{17}_{9}F$ (d) ${}^{7}_{3}Li, {}^{7}_{4}Be$

2. Two protons are kept at a separation of 10 nm. Let F_n and F_e be the nuclear force and the electromagnetic force between them-

(a) $F_e = F$

(b) $F >> F_n$

(c) $F_e << F_n$

(d) F_e and F_n differ only slightly

3. The nuclei ${}_6A^{13}$ and ${}_7B^{14}$ can be described as

(a) Isotones

(b) Isobars

(c) Isotopes of carbon

(d) Isotopes of nitrogen

4. The nuclear radius as compared to the atomic radius is of the order

(a) 10^{-3} (b) 10^{-5}

(c) 10^{-7} (d) 10^{-9}

5. When two nuclei of mass X and Y respectively fuse to form a nucleus of mass m alongwith the liberation of some energy, then

(a) X + Y > m (b) X – Y = m

(c) X + Y = m (d) X + Y < m

6. Radius of ${}^{4}_{2}He$ nucleus is 3 Fermi. The radius of ${}^{32}_{16}S$ nucleus will be

(a) 6 Fermi (b) 4 Fermi

(c) 5 Fermi (d) 8 Fermi

7. Order of magnitude of density of uranium nucleus is [$m_p = 1.67 \times 10^{-27}$ kg].

(a) 10^{20} kg/m^3 (b) 10^{17} kg/m^3

(c) 10^{14} kg/m^3 (d) 10^{11} kg/m^3

8. Two nuclei have mass number in ratio of 1 : 4. The ratio of their nuclear densities is:

(a) 1 : 4 (b) 1 : 2

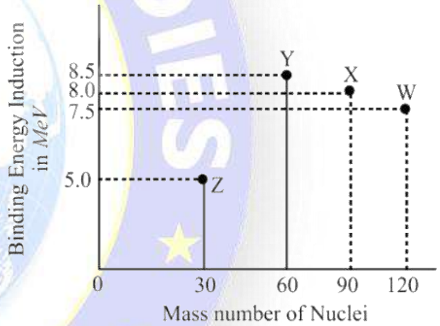
(c) 1 : 64 (d) 1 : 1

9. The binding energy of nucleus is a measure of its

(a) Mass (b) Stability

(c) Charge (d) Momentum

10. Binding energy per nucleon vs mass number curve for nuclei is shown in figure. W, X, Y and Z are four nuclei indicated on the curve. The process that would release energy is



(a) $Y \to Z$ (b) $W \to X + Z$

(c) $W \to 2Y$ (d) $X \to Y + Z$

11. The masses of neutron and proton are 1.0087 amu and 1.0073 amu respectively. If a helium nucleus (alpha particles) of mass 4.0015 amu is formed by combining neutrons and protons. The binding energy of the helium nucleus will be (1 amu 931MeV)

(a) 24.8M eV (b) 28.4M eV

(c) 14.2M eV (d) 42.8M eV

12. The binding energy of α-particle ${}^{4}_{2}He$ is 7.047 MeV per nucleon and the binding energy of deutron ${}^{2}_{1}H$ is 1.112 MeV per nucleon. Then in the fusion reaction ${}^{2}_{1}H + {}^{2}_{1}H \to {}^{4}_{2}He + Q$, the energy Q released is

(a) 23.74MeV (b) 32.82MeV
(c) 11.9MeV (d) 4.94MeV

13. The binding energy per nucleon for a$_6C_{12}$ nucleus is (Nuclear mass of $_6C^{12}$ = 12.00000 amu.
Mass of hydrogen nucleus = 1.007825 amu,
Mass of neutron = 1.008665 amu.)
(a) 2.675MeV (b) 7.675MeV
(c) 0MeV (d) 3.675MeV

14. Consider the nuclear reaction $X^{200} \rightarrow A^{110} + B^{90}$. If the binding energy per nucleon for X, A and B is 7.4 MeV, 8.2MeV and 8.2MeV respectively, then the amount of the energy released is
(a) 200 MeV (b) 160 MeV
(c) 110 MeV (d) 90 MeV

15. The graph of In(R/R_0) versus In A(R = radius of a nucleus and A = its mass number) is-
(a) a straight line (b) a parabola
(c) an ellipse (d) none of these

ANSWER KEY

1. (a)	**4.** (b)	**7.** (b)	**10.** (c)	**13.** (b)
2. (b)	**5.** (a)	**8.** (d)	**11.** (b)	**14.** (b)
3. (a)	**6.** (a)	**9.** (b)	**12.** (a)	**15.** (a)