

Q1. 22 January Shift 1

The minimum frequency of photon required to break a particle of mass 15.348 amu into 4α particles is ____ kHz.

[mass of He nucleus = 4.002 amu, 1 amu = 1.66×10^{-27} kg, $h = 6.6 \times 10^{-34}$ J.s and $c = 3 \times 10^8$ m/s]

- (1) 14.94×10^{19} (2) 9×10^{20} (3) 14.94×10^{20} (4) 9×10^{19}

Q2. 22 January Shift 1

7.9 MeV α -particle scatters from a target material of atomic number 79. From the given data the estimated diameter of nuclei of the target material is (approximately) ____ m. $\left[\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2/\text{C}^2 \right]$ and electron charge $= 1.6 \times 10^{-19} \text{ C}$

- (1) 1.44×10^{-13} (2) 5.76×10^{-14} (3) 2.88×10^{-14} (4) 1.69×10^{-12}

Q3. 23 January Shift 2

Which of the following pair of nuclei are isobars of the element?

- (1) ${}^3_1\text{H}$ and ${}^3_2\text{He}$ (2) ${}^2_1\text{H}$ and ${}^3_1\text{H}$ (3) ${}^{198}_{80}\text{Hg}$ and ${}^{197}_{79}\text{Au}$ (4) ${}^{236}_{92}\text{U}$ and ${}^{238}_{92}\text{U}$

Q4. 23 January Shift 2

The average energy released per fission for the nucleus of ${}^{235}_{92}\text{U}$ is 190 MeV. When all the atoms of 47 g pure ${}^{235}_{92}\text{U}$ undergo fission process, the energy released is $\alpha \times 10^{23}$ MeV. The value of α is ____.

(Avogadro Number = 6×10^{23} per mole)

Q5. 24 January Shift 1

Given below are two statements:

Statement I: For all elements, greater the mass of the nucleus, greater is the binding energy per nucleon.

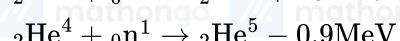
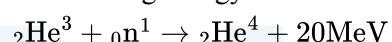
Statement II: For all elements, nuclei with less binding energy per nucleon transforms to nuclei with greater binding energy per nucleon.

In the light of the above statements, choose the correct answer from the options given below

- (1) Statement I is true but Statement II is false (2) Both Statement I and Statement II are true
 (3) Both Statement I and Statement II are false (4) Statement I is false but Statement II is true

Q6. 24 January Shift 2

The binding energy for the following nuclear reactions are expressed in MeV.



If X_3, X_4, X_5 denote the stability of ${}^2\text{He}^3$, ${}^2\text{He}^4$ and ${}^2\text{He}^5$, respectively, then the correct order is :

- (1) $X_4 < X_5 < X_3$ (2) $X_4 > X_5 > X_3$ (3) $X_4 > X_5 < X_3$ (4) $X_4 = X_5 = X_3$

Q7. 28 January Shift 1

An atom 8_3X is bombarded by shower of fundamental particles and in 10 s this atom absorbed 10 electrons, 10 protons and 9 neutrons. The percentage growth in the surface area of the nucleons is recorded by:

- (1) 250% (2) 150% (3) 900% (4) 225%

Q8. 28 January Shift 2

A nucleus has mass number α and radius R_α . Another nucleus has mass number β and radius R_β . If $\beta = 8\alpha$ then R_α/R_β is:

- (1) 8 (2) 0.5 (3) 2 (4) 1

ANSWER KEYS

1. (1) 2. (2) 3. (1) 4. 228 5. (4) 6. (2) 7. (4) 8. (2)