Mod-4 and Mod-5

***Option in bold letters is the answer**

Q1. The force acting between proton and proton inside the nucleus is

(a) Coulombic (b) Nuclear **(c) Both** (d) None of these

Sol. **(c)** Coulomb force between proton-proton and nuclear force between proton-neutron or proton-proton also act inside the nucleus

Q2. Size of nucleus is of the order of

(a) 10^{-10} m **(b) 10^{-15} m** (c) 10^{-12} m (d) 10^{-19} m

Q3. The mass number of a nucleus is equal to the number of

(a) Electrons it contains (b) Protons it contains
(c) Neutrons it contains **(d) Nucleons it contains**

Q4. Radius of $^{4}_{2}He$ nucleus is 3 *fermi*. The radius of $^{108}_{47}Ag$ nucleus will be

(a) 5 $fermi$ (b) 6 $fermi$ **(c) 11.16 $fermi$** (d) 8 $fermi$

Sol. **(c)** $\boldsymbol{r \propto A^{\frac{1}{3}} \Rightarrow \frac{r_2}{r_1} = \left(\frac{A_2}{A_1}\right)^{\frac{1}{3}} = \left(\frac{108}{4}\right)^{\frac{1}{3}}}$

$\Rightarrow \; r_2 = 3\,(27)^{\frac{1}{3}} = 3 \times 3 = 9\,fermi$

Q5. The average binding energy per nucleon in the nucleus of an atom is approximately

(a) 8 eV (b) 8 KeV **(c) 8 MeV** (d) 8 J

Q6. Nuclear binding energy is equivalent to

(a) Mass of proton (b) Mass of neutron (c) Mass of nucleus **(d) Mass defect of nucleus**

Sol. **(d)** $B.E. = \Delta m\,amu = \Delta m \times 931\,MeV$

Q7. In a fission reaction ${}^{236}_{92}U \rightarrow {}^{117}X + {}^{117}Y + n + n$, the binding energy per nucleon of X and Y is 8.5 MeV whereas of ${}^{236}U$ is 7.6 MeV. The total energy liberated will be about

(a) 2000 KeV (b) 2 MeV **(c) 200 MeV** (d) 2000 MeV

Sol. **(c)** $\Delta E = 8.5 \times (117 + 117) - 7.6 \times 236 = 195.4\, MeV \approx \mathbf{200\, MeV}$

Q8. In a working nuclear reactor, cadmium rods (control rods) are used to

(a) Speed up neutrons (b) Slow down neutrons **(c) Absorb some neutrons** (d) Absorb all neutrons

Sol. **(c)** Cadmium rods absorb the neutrons so they are used to control the chain reaction process.

Q9. Thermal neutrons can cause fission in

(a) **U^{235}** (b) U^{238} (c) Pu^{238} (d) Th^{232}

Sol. Fission of U^{235} occurs by slow neutrons only (of energy about $1eV$) or even by thermal neutrons (of energy about $0.025\ eV$).

Q10. Which of the following is the fusion reaction

(a) $_1H^2 + {}_1H^2 \rightarrow {}_2He^4$

(b) $_0n^1 + {}_7N^{14} \rightarrow {}_6C^{14} + {}_1H^1$

(c) $_0n^1 + {}_{92}U^{238} \rightarrow {}_{93}Np^{239} + \beta^{-1} + \gamma$

(d) $_1H^3 \rightarrow {}_2He^3 + \beta^{-1} + \gamma$

Sol. **(a)** $_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + 24$ MeV