Physicsaholics

DPP – 1

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Q 1. A α particle after passing through a potential difference of V volt collides with a nucleus. If the atomic number of the nucleus is Z then the distance of closest approach of α-particle to the nucleus will be-

(a) $14.4\frac{Z}{V}$ Å (b) $14.4\frac{Z}{V}$ m

(c) $14.4\frac{Z}{V}$ cm (d) All of the above

Q 2. An α-particle of energy 5 MeV is scattered through 180° by a stationary uranium nucleus. The distance of closest approach is of the order of -

(a) 1Å (b) 10^{-10} cm

(c) 10^{-12} cm (d) 10^{-15} cm

Q 3. Two protons are kept at a separation of 50Å. Fn is the nuclear force and Fe is the electrostatic force between them, then -

(a) Fn >> Fe (b) Fn = Fe (c) Fn << Fe (d) Fn » Fe

Q 4. As the mass number A increases, which of the following quantities related to a nucleus do not change -

(a) mass (b) volume

(c) density (d) binding energy

Q 5. Particles which can be added to the nucleus of an atom without changing its chemical properties are called –

(a) Neutrons (b) electrons

(c) Protons (d) Alpha-particles

Q 6. Which of the following is not isotone with others ?

(a) $^{40}_{18}Ar$ (b) $^{42}_{20}Ca$

(c) $^{43}_{21}Sc$ (d) $^{41}_{21}Sc$

Q 7. The radius of the nucleus with nucleon number 2 is 1.5×10^{-15}m, then the radius of nucleus with nucleon number 54 will be -

(a) 3×10^{-15} m (b) 4.5×10^{-15} m

(c) 6×10^{-15} m (d) 9.5×10^{-15} m

Q 8. If there are N nucleons in a nucleus of radius R, then the number of nucleons in a nucleus of radius 2R will be -

(a) N (b) 2N (c) 8N (d) $2^{1/3}$N

Q 9. Attractive nuclear forces exist between -
(a) neutron - neutron (b) proton - proton
(c) neutron - proton (d) all of the above

Q 10. Binding energies of nuclei ${}_1^2H$, ${}_2^4He$, ${}_{25}^{56}Fe$ and ${}_{92}^{235}U$ are 2.22, 28.3, 492 and 1786 respectively. Most stable nucleus is -
(a) ${}_{25}^{56}Fe$ (b) ${}_1^2H$ (c) ${}_{92}^{235}U$ (d) ${}_2^4He$

Q 11. The binding energy of a deuterium nucleus is about 1.115 MeV per nucleon. Then the mass defect of the nucleus is about –
(a) 2.23 u (b) 0.0024 u
(c) 2077 u (d) None of the above

Q 12. In nuclear reactions –
(a) mass and momentum both are conserved
(b) energy and momentum both are conserved
(c) charge and momentum both are conserved
(d) energy and charge both are conserved

Q 13. If the mass of proton = 1.008 a.m.u. and mass of neutron = 1.009 a.m.u., then binding energy per nucleon for ${}_4^9Be$ (mass = 9.012 amu) would be –
(a) 0.065 MeV (b) 60.44 MeV
(c) 67.2 MeV (d) 6.72 MeV

Q 14. If the binding energy per nucleon in Li^7 and He^4 nuclei are 5.60 MeV and 7.06 MeV, then energy of the reaction $Li^7 + H^1$ ¾ → $2\,{}_2^4He$ is –
(a) 19.6 MeV (b) 2.4 MeV
(c) 8.4 MeV (d) 17.3 MeV

Q 15. If the rest mass of electron or positron is 0.51 MeV, then the kinetic energy of each particle in the electron-positron pair production by a γ-photon of 2.42 MeV will be –
(a) 0.3 MeV (b) 1.9 MeV
(c) 0.7 MeV (d) 1.5 MeV

Q 16. An electron and a positron may annihilate one another producing two γ-ray photons of equal energy. The minimum energy of each of these photons is –
(a) 8.2×10^{-14} MeV (b) 8.2×10^{-14} J
(c) 16.4×10^{-14} MeV (d) 16.4×10^{-14} J

Q 17. A nuclear fission is represented by the following reaction :
$U^{236} = X^{111} + Y^{122} + 3n$
If the binding energies per nucleon of X^{111}, Y^{122} and U^{236} are 8.6MeV, 8.5 MeV and 7.6 MeV respectively, then the energy released in the reaction will be –
(a) 200 MeV (b) 202 MeV
(c) 195 MeV (d) 198 MeV

Q 18. Calculate the mass defect for helium-4 nucleus, given M(He) = 4.0015084, M(p) = 1.007276 u, M(n) = 1.008665u –

(a) 0.03074
(b) 0.030384
(c) 0.030374
(d) 0.30374

Answer Key

Q.1 a	**Q.2 c**	**Q.3 c**	**Q.4 c**	**Q.5 a**
Q.6 d	**Q.7 b**	**Q.8 c**	**Q.9 d**	**Q.10 a**
Q.11 b	**Q.12 c**	**Q.13 d**	**Q.14 d**	**Q.15 c**
Q.16 b	**Q.17 d**	**Q.18 c**		