Worksheet

(Chapter 1 Basic Nuclear Properties)

MCQ (Multiple Choice Questions)

Q1. The distance of closest approach b of an α - particle of kinetic energy E to a gold is proportional to

(a) E (b) E^{-1} (c) E^{2} (d) E^{-2}

Q2. The distance of closest approach of an α - particle of kinetic energy $1.0\,MeV$ to a gold nucleus of atomic number 79 . Given that charge of an electron is 1.6×10^{-19} coulomb.

(a) $2.275\times10^{-13}m$ (b) $2.275\times10^{-14}m$ (c) $2.275\times10^{-15}m$ (d) $2.275\times10^{-16}m$

Q3. 1 order of nucleus radius is given by

(a) $10^{-6}m$ (b) $10^{-10}m$ (c) $10^{-12}m$ (d) $10^{-15}m$

Q4. If A is mass number of any nucleus then radius is proportional to

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

Q5. A nucleus has a size of $10^{-15}m$. Consider an electron bound within a nucleus. The estimated momentum of this electron is of the order of

(a) $6.6\times10^{-18}kgm/\sec$ (b) $6.6\times10^{-19}kgm/\sec$

(c) $6.6\times10^{-20}kgm/\sec$ (d) $6.6\times10^{-22}kgm/\sec$

Q6. According to fermi model of nucleus fermi momentum of proton is proportional to atomic mass A as

(a) $A^{1/3}$ (b) $A^{-1/3}$ (c) $A^{2/3}$ (d) $A^{-2/3}$

Q7. According to fermi model of nucleus fermi energy of proton is proportional to atomic mass A as

(a) $A^{1/3}$ (b) $A^{-1/3}$ (c) $A^{2/3}$ (d) $A^{-2/3}$

Q8. According to fermi model of nucleus average energy of nucleus is proportional to atomic mass A as

(a) $A^{1/3}$ (b) $A^{-1/3}$ (c) $A^{2/3}$ (d) $A^{-2/3}$

Q9. According to fermi model of nucleus total energy of nucleus is proportional to atomic mass A as

(a) $E_{total}=\left(\frac{9\pi}{4}\right)^{2/3}\frac{\hbar^2c^2}{mc^2R_0^2}\left[\frac{3}{10}A^2+\frac{1}{6}\left(\frac{N-Z}{A}\right)^2\right]$

(b) $E_{total}=\left(\frac{9\pi}{4}\right)^{2/3}\frac{\hbar^2c^2}{mc^2R_0^2}\left[\frac{3}{10}A+\frac{1}{6}\left(\frac{N-Z}{A}\right)\right]$

(c) $E_{total}=\left(\frac{9\pi}{4}\right)^{2/3}\frac{\hbar^2c^2}{mc^2R_0^2}\left[\frac{3}{10}A^2+\frac{1}{6}\left(\frac{N-Z}{A}\right)^2\right]$

(d) $E_{total}=\left(\frac{9\pi}{4}\right)^{2/3}\frac{\hbar^2c^2}{mc^2R_0^2}\left[\frac{3}{10}A+\frac{1}{6}\left(\frac{N-Z}{A}\right)^2\right]$

NAT (Numerical Answer Type)

Q10. Given the mass of iron nucleus as $55.85u$ and $A=56$, then nuclear density is given by $\alpha\times10^{17}kg/m^3$, then the value of α is _____

Q11. The radius of carbon atom C_6^{12} is α Fermi, then the value of α is_____

Q12. The volume of nucleus of atom C_6^{12} is given by $\alpha(fermi)^3$, then the value of α is _____

Q13. The density of nucleus of atom C_6^{12} is given by $\alpha\times10^{17}kg/m^3$, then the value of α is _____

Q14. What will be the ratio of the sizes of Pb_{82}^{208} and Mg_{12}^{26} nuclei?

Q15. The radius of a $_{29}Cu^{64}$ nucleus is measured to be 4.8×10^{-15} m. And the radius of a $_{12}Mg^{27}$ nucleus is $\alpha\times10^{-15}m$. Then what will be value of α?

Q16. The mean momentum $\vec{p}$ of a nucleon in a nucleus of mass number A and atomic number Z depends on A and Z. If p_c is momentum of carbon nucleus and p_I is momentum of iron nucleus then ratio of $\frac{p_c}{p_I}$ is _____

Q17. For the carbon atom C_6^{12}, the average value of momentum is given by $\alpha\times10^{-19}$. Then what will be value of α?

Q18. According to fermi model of nucleus, Fermi momentum of proton is proportional to atomic number as Z^{α}. Then the value of α is _____

Q19. According to fermi model of nucleus, Fermi energy of proton is proportional to atomic number as Z^{α}, Then the value of α is _____