

PYQ [IIT-JAM]

(Chapter 1 Basic Nuclear Properties)

Q1. The relation between the nuclear radius (R) and the mass number (A), given by $R = 1.2 A^{1/3}$ fm, implies that

- (a) The central density of nuclei is independent of A
- (b) The volume energy per nucleon is a constant
- (c) The attractive part of the nuclear force has a long range
- (d) The nuclear force is charge dependent

IIT-JAM 2019

Q2. A proton is confined within a nucleus of size 10^{-13} cm. The uncertainty in its velocity is _____ $\times 10^8$ m/s.

(Round off to 2 decimal places)

(Planck's constant $h = 6.626 \times 10^{-34}$ J and proton mass $m_p = 1.672 \times 10^{-27}$ kg)

IIT-JAM 2019

Q3. A nucleus has a size of 10^{-15} m. Consider an electron bound within a nucleus. The estimated energy of this electron is of the order of

- (a) 1 MeV
- (b) 10^2 MeV
- (c) 10^4 MeV
- (d) 10^6 MeV

IIT-JAM 2015

Q4. The mean momentum \bar{p} of a nucleon in a nucleus of mass number A and atomic number Z depends on A, Z as

- (a) $\bar{p} \propto A^{1/3}$
- (b) $\bar{p} \propto Z^{1/3}$
- (c) $\bar{p} \propto A^{-1/3}$
- (d) $\bar{p} \propto (AZ)^{2/3}$

IIT-JAM 2018

PYQ [GATE]

- Q1. Inside a large nucleus, a nucleon with mass $939 \text{ MeV}c^{-2}$ has Fermi momentum 1.40 fm^{-1} at absolute zero temperature. Its velocity is Xc , where the value of X is _____ (up to two decimal places).

$(\hbar c = 197 \text{ MeV}\cdot\text{fm})$

GATE-2018

- Q2. The mean kinetic energy of a nucleon in a nucleus of atomic weight A varies as A^n , where n is _____ (upto two decimal places)

GATE-2015

- Q3. According to the Fermi gas model of nucleus, the nucleons move in a spherical volume of radius $R (= R_0 A^{\frac{1}{3}}$, where A is the mass number and R_0 is an empirical constant with the dimensions of length). The Fermi energy of the nucleus E_F is proportional to

(a) R_0^2

(b) $\frac{1}{R_0}$

(c) $\frac{1}{R_0^2}$

(d) $\frac{1}{R_0^3}$

GATE- 2020

PYQ [NET-JRF]

Q1. The radius of a ${}_{29}^{64}\text{Cu}$ nucleus is measured to be 4.8×10^{-13} cm. The radius of a ${}_{12}^{27}\text{Mg}$ nucleus can be estimated to be

- (a) 2.86×10^{-13} cm (b) 5.2×10^{-13} cm (c) 3.6×10^{-13} cm (d) 8.6×10^{-13} cm

NET/JRF (JUNE-2011)

Q2. The intrinsic electric dipole moment of a nucleus ${}^A_Z X$

- (a) increases with Z , but independent of A
(b) decreases with Z , but independent of A
(c) is always zero
(d) increases with Z and A

NET/JRF (DEC-2013)

Q3. In deep inelastic scattering electrons are scattered off protons to determine if a proton has any internal structure. The energy of the electron for this must be at least

- (a) 1.25×10^9 eV (b) 1.25×10^{12} eV (c) 1.25×10^6 eV (d) 1.25×10^8 eV

NET/JRF (DEC-2014)