PYQ [IIT-JAM]

(Chapter 3 Radioactivity)

Q1. A particular radioisotope has a half-life of 5 days. In 15 days the probability of decay in percentage will be_____

IIT-JAM 2016

Q2. $^{60}_{27}Co$ is a radioactive nucleus of half-life $2\ln 2\times 10^{8}s$. The activity of $10g$ of $^{60}_{27}Co$ in disintegrations per second is,

(a) $\frac{1}{5}\times 10^{10}$ (b) 5×10^{10} (c) $\frac{1}{5}\times 10^{14}$ (d) 5×10^{14}

IIT-JAM 2012

Q3. The activity of a radioactive sample is decreased to 75% of the initial value after 30 days. The half-life (in days) of the sample is approximately

[You may use $\ln 3\approx 1.1,\ \ln 4\approx 1.4$]

(a) 38 (b) 45 (c) 59 (d) 69

IIT-JAM 2008

Q4. In a typical human body, the amount of radioactive ^{40}K is 3.24×10^{-5} percent of its mass. The activity due to ^{40}K in a human body of mass $70\,\text{kg}$ is _____kBq.

(Round off to 2 decimal places)

(Half-life of $^{40}K = 3.942\times 10^{16}\,\text{S}$, Avogadro's number $N_A = 6.022\times 10^{23}\,\text{mol}^{-1}$

IIT-JAM 2019

Q5. An atomic nucleus X with half-life T_X decays to a nucleus Y, which has half-life T_Y. The condition (s) for secular equilibrium is (are)

(a) $T_X \simeq T_Y$ (b) $T_X < T_Y$ (c) $T_X \ll T_Y$ (d) $T_X \gg T_Y$

IIT-JAM 2019

Q6. For an atomic nucleus with atomic number Z and mass number A, which of the following is (are) correct?

(a) Nuclear matter and nuclear charge are distributed identically in the nuclear volume

(b) Nuclei with $Z > 83$ and $A > 209$ emit α - radiation

(c) The surface contribution to the binding energy is proportional to $A^{2/3}$

(d) β - decay occurs when the proton to neutron ratio is large, but not when it is small

IIT-JAM 2017

Q7. The radioactive nuclei ^{40}K decay to ^{40}Ar with a half-life of 1.25×10^{9} years. The $\frac{^{40}K}{^{40}Ar}$ isotopic ratio for a particular rock is found to be 50. The age of the rock is $m\times10^{7}$ years. The value of m is _____. (Round off to 2 decimal places)

IIT-JAM 2020

PYQ [GATE]

Q1. An α particle is emitted by a $^{230}_{90}Th$ nucleus. Assuming the potential to be purely Coulombic beyond the point of separation, the height of the Coulomb barrier is_____ MeV (up to two decimal places).

$(\frac{e^2}{4\pi\in_0}=1.44\,MeV\text{-fm}, r_0=1.30\,\text{fm})$

GATE-2018

Q2. Consider the reaction $^{54}_{25}Mn+e^{-}\rightarrow^{54}_{24}Cr+X$. The particle X is

(a) γ (b) ν_e (c) n (d) π^0

GATE-2016

Q3. In the nuclear reaction $^{13}C_6 + \nu_e \rightarrow {}^{13}N_7 + X$, the particle X is

(a) An electron (b) An anti-electron (c) A muon (d) A pion

GATE-2017

Q4. A radioactive element X has a half-life of 30 hours. It decays via alpha, beta and gamma emissions with the branching ratio for beta decay being 0.75. The partial half-life for beta decay in unit of hours is _____

GATE-2019

PYQ [NET-JRF]

Q1. A radioactive element X decays to Y, which in turn decays to a stable element Z. The decay constant from X to Y is λ_1, and that from Y to Z is λ_2. If, to begin with, there are only N_0 atoms of X, at short times ($t \ll \frac{1}{\lambda_1}$ as well as $\frac{1}{\lambda_2}$) the number of atoms of Z will be

(a) $\frac{1}{2}\lambda_1\lambda_2 N_0 t^2$

(b) $\frac{\lambda_1\lambda_2}{2(\lambda_1+\lambda_2)} N_0 t$

(c) $(\lambda_1+\lambda_2)^2 N_0 t^2$

(d) $(\lambda_1+\lambda_2) N_0 t$

NET/JRF (JUNE-2016)