Q.1 $^{14}_{6}C$ decays by emission of

(A) β^- (B) β^+ (C) n (D) α

Q.2 The number of α and β-particles emitted, when the following nuclear transformation takes place are _____ and _____ respectively.

$^{238}_{92}X \longrightarrow {}^{206}_{82}Y$

(A) 6, 2 (B) 5, 6 (C) 8, 4 (D) 8, 6

Q.3 When $^{30}_{15}P$ emits a positron, the daughter nuclide formed is

(A) $_{15}P^{29}$ (B) $16Si^{30}$ (C) $_{14}Si^{30}$ (D) $_{16}P^{30}$

Q.4 Symbol is needed to complete the nuclear equation $^{63}_{29}Cu(p,.....)\,^{62}_{29}Cu$

(A) $_1H^2$ (B) $_0n^1$ (C) $_2He^4$ (D) $_{-1}n^0$

Q.5 $^{27}_{13}Al$ is a stable isotope. $^{29}_{13}Al$ is expected to disintegrated by

(A) α emission (B) $^{0}_{-1}\beta$ emission (C) Positron emission (D) Proton emission

Q.6 Loss of a β – particle is equivalent to

(A) Increase of one proton only (B) Decrease of one neutron only

(C) Both (A) and (B) (D) None of these.

Q.7 The half-life of a radioactive isotope is three hours. If the initial mass of the isotope were 256 g, the mass of it remaining undecayed after 18 hours would be

(A) 16.0 g (B) 4.0 g (C) 8.0 g (D) 12.0 g

Q.8 Consider the following nuclear reactions:

$$^{238}_{92}M \rightarrow {}^{X}_{Y}N + 2\,{}^{4}_{2}He;\ {}^{X}_{Y}N \rightarrow {}^{A}_{B}L + 2\beta^+$$

The number of neutrons in the element L is

(A) 142 (B) 144 (C) 140 (D) 146

Q.9 The half-life of a radioisotope is four hours. If the initial mass of the isotope was 200 g, the mass remaining after 24 hours undecayed is

(A) 1.042 g (B) 2.084 g (C) 3.125 g (D) 4.167 g

Q.10 Which of the following nuclear reactions will generate an isotope?

(A) neutron particle emission (B) positron emission

(C) α-particle emission (D) β-particle emission

Q.11 The analysis of a mineral of uranium reveals that ratio of mole of ^{206}Pb and ^{238}U in sample is 0.2. If effective decay constant of process $^{238}U \longrightarrow {}^{206}Pb$ is λ then age of rock is

(A) $\frac{1}{\lambda}\ln\frac{5}{4}$ (B) $\frac{1}{\lambda}\ln\left(\frac{5}{1}\right)$ (C) $\frac{1}{\lambda}\ln\frac{4}{1}$ (D) $\frac{1}{\lambda}\ln\left(\frac{6}{5}\right)$

Q.1 Two radioactive material A_1 and A_2 have decay constants of $10\lambda_0$ and λ_0. If initially they have same number of nuclei, then after time $\frac{1}{9\lambda_0}$ the ratio of number of their undecayed nuclei will be

(A) $\frac{1}{e}$ (B) $\frac{1}{e^2}$ (C) $\frac{1}{e^3}$ (D) $\frac{\sqrt{e}}{1}$

Q.2 Helium nuclie combines to form an oxygen nucleus. The energy released per nucleon of oxygen nucleus is if $m_0 = 15.834$ amu and $m_{He} = 4.0026$ amu

(A) 10.24 MeV (B) 0 MeV (C) 5.24 MeV (D) 4 MeV

Q.3 A radioactive element gets spilled over the floor of a room. Its half-life period is 30 days. If the initial activity is ten times the permissible value, after how many days will it be safe to enter the room?

(A) 1000 days (B) 300 days (C) 10 days (D) 100 days

Q.4 The radioactive sources A and B of half lives of t hr and 2t hr respectively, initially contain the same number of radioactive atoms. At the end of t hours, their rates of disintegration are in the ratio :

(A) $2\sqrt{2} : 1$ (B) 1 : 8 (C) $\sqrt{2} : 1$ (D) $\ln 2 : 1$

Q.5 A sample contains 0.1 gram-atom of radioactive isotope ${}^{A}_{Z}X$ ($t_{1/2} = 5$ days). How many number of atoms will decay during eleventh day? [N_A = Avogadro's number]

(A) $0.1\left(-e^{-\frac{0.693\times11}{5}} + e^{-\frac{0.693\times10}{5}}\right)$ (B) $0.1\left(-e^{\frac{0.693\times11}{5}} + e^{\frac{0.693\times10}{5}}\right)$

(C) $0.1\left(-e^{-\frac{0.693\times11}{5}} + e^{-\frac{0.693\times10}{5}}\right)N_A$ (D) $0.1\left(-e^{\frac{0.693\times11}{5}} + e^{\frac{0.693\times10}{5}}\right)N_A$

Q.6 The average (mean) life at a radio nuclide which decays by parallel path is

$A \xrightarrow{\lambda_1} B$; $\lambda_1 = 1.8 \times 10^{-2}$ sec^{-1}

$2A \xrightarrow{\lambda_2} C$; $\lambda_2 = 10^{-3}$ sec^{-1}

(A) 52.63 sec (B) 500 sec (C) 50 sec (D) None

Q.7 A sample of $^{14}CO_2$ was to be mixed with ordinary CO_2 for a biological tracer experiment. In order that 10 cm^3 of diluted gas should have 10^4 dis/min, what activity (in μCi) of radioactive carbon is needed to prepare 60 L of diluted gas at STP. [1 Ci = 3.7×10^{10} dps]

(A) 270 μCi (B) 27 μCi (C) 2.7 μCi (D) 2700 μCi

Q.8 **Read the following :**

(i) The half–life period of a radioactive element X is same as the mean–life time of another radioactive element Y. Initially both of them have the same number of atoms. Then Y will decay at a faster rate than X.

(ii) The electron emitted in beta radiation originates from decay of a neutron in a nucleus