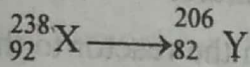


SBG STUDY

- Q.1 $^{14}_6\text{C}$ 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.



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

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

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

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

- (A) $^1_1\text{H}^2$ (B) ^1_0n (C) ^4_2He (D) $^0_{-1}\text{n}$

- Q.5 $^{27}_{13}\text{Al}$ is a stable isotope. $^{29}_{13}\text{Al}$ 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

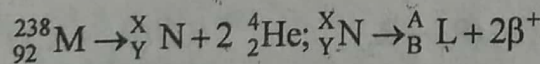
- (A) Increase of one proton only (B) Decrease of one neutron only
 (C) Both (A) and (B) (D) None of these.

- 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

$$\text{Remaining} = \frac{256}{2^6}$$

- Q.8 Consider the following nuclear reactions:



$$238 = x + 8$$

$$x = 230$$

$$92 = y + 4$$

$$92 - 4 = y \quad y = 88$$

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

$$\frac{200}{2^6}$$

- 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 $^{238}\text{U} \longrightarrow ^{206}\text{Pb}$ 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 nuclei combines to form an oxygen nucleus. The energy released per nucleon of oxygen nucleus is if $m_O = 15.834$ 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) $0.1 \left(-e^{-\frac{0.693 \times 11}{5}} + e^{-\frac{0.693 \times 10}{5}} \right)$ (B) $0.1 \left(-e^{-\frac{0.693 \times 11}{5}} + e^{-\frac{0.693 \times 10}{5}} \right)$
 (C) $0.1 \left(-e^{-\frac{0.693 \times 11}{5}} + e^{-\frac{0.693 \times 10}{5}} \right) N_A$ (D) $0.1 \left(-e^{-\frac{0.693 \times 11}{5}} + e^{-\frac{0.693 \times 10}{5}} \right) N_A$

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

- $A \xrightarrow{\lambda_1} B; \quad \lambda_1 = 1.8 \times 10^{-2} \text{ sec}^{-1}$
 $2A \xrightarrow{\lambda_2} C; \quad \lambda_2 = 10^{-3} \text{ sec}^{-1}$
- (A) 52.63 sec (B) 500 sec (C) 50 sec (D) None

Q.7 A sample of ${}^{14}\text{CO}_2$ 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. [$1 \text{ Ci} = 3.7 \times 10^{10} \text{ dps}$]

- (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