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REVISION TEST -08 Total Marks -30

12th Physics – Nuclei Physics

Multiple Choice Questions 5x1 =5

1. Atomic mass unit (u) is defined as _____of the mass of the carbon (^{12}C) atom.
   a. $\left(\frac{1}{10}\right)^{th}$
   b. $\left(\frac{1}{16}\right)^{th}$
   c. $\left(\frac{1}{12}\right)^{th}$
   d. $\left(\frac{1}{14}\right)^{th}$
2. In a nuclear fission, 0.1% mass is converted into energy. The energy released by the fission of 1 kg mass will be:
   a. $9 \times 10^{13} J$
   b. $9 \times 10^{16} J$
   c. $9 \times 10^{17} J$
   d. $9 \times 10^{19} J$
3. What is the percentage of the mass of an atom concentrated in the nucleus?
   a. $66.9\,\%$
   b. 50.9%
   c. 99.9%
   d. 79.9%
4. A uranium nucleus (atomic number 92, mass number 238) emits an alpha particle and the resultant nucleus emits a β particle. The atomic and mass numbers respectively of the final nucleus are
   a. 90,236
   b. 90,240
   c. 91,234
   d. 92,232
5. The percentage of the original quantity of a radioactive material left after five half lives is approximately
   a. 20%
   b. 5.67%
   c. 1%

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d. 3.12%

Short Type 1 Questions 4 x2 =8

6. Name the reaction which takes place when a slow neutron beam strikes. $^{235}_{92}U$ nuclei. Write the nuclear reaction involved.
7. A radioactive isotope has a half life of T years. How long will it take the activity to reduce to (a) 3.125% (b) 1% of its original value?
8. The radioactive decay rate of a radioactive element is found to be 10^3 disintegrations / sec, at a certain time. If half life of the element is one second, what would be the decay rate after 1 sec., and after 3 sec.?
9. In a given sample, two radio isotopes A and B are initially present in the ratio of 1: 4. The half-lives of A and B are 100yr and 50yr, respectively. Find the time after which the amounts of A and B become equal.

Short Type 2 Questions 3 x3 =9

10. Why is the ionizing power of α- particle greater than that of gamma rays?
11. i. Complete the following nuclear reactions:
    a. $^{208}_{84}Po \rightarrow ^{204}_{82}Pb + \ldots\ldots$
    b. $^{32}_{15}P \rightarrow ^{32}_{16}S + \ldots\ldots$
    ii. Write the basic process involved in nuclei responsible for (a) β^- and
    iii. Why is it found experimentally difficult to detect neutrinos?
12. i. Why is the binding energy per nucleon found to be constant for nuclei in the range of mass number (A) lying between 30 and 170?
    ii. When a heavy nucleus with mass number A = 240 breaks into two nuclei, A = 120, energy is released in the process.

Long Type Questions 2 x4 =8

13. Would the energy be released or needed for the following D-T reaction $^2_1H + ^3_1H \rightarrow ^4_2He + ^1_0n$ to occur?Given: $m\left(^2_1H\right) = 2.014102u$, $m\left(^3_1H\right) = 3.016049u$ $m\left(^4_2He\right)$ = 4.002603 u, $m\left(^1_0n\right)$ = 1.008665 u. Calculate this energy in MeV.
14. A radioactive substance has a half life period of 30 days.
    Calculate:
    i. time taken for $\frac{3}{4}$ of original number of atoms to disintegrate and
    ii. time taken for $\frac{1}{8}$ of the original number of atoms to remain unchanged.

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