CLASS : XII
PHYSICS ASSIGNMENT

Unit - VIII : Atoms & Nuclei

1. **Define the half life period of a radioactive substance. Establish its relationship with decay constant.**
2. **Explain how Rutherford's experiment on scattering of alpha – particle led to estimation of size of nucleus.**
3. **Draw a diagram to show the variation of binding energy per nucleon with mass no. of different nuclei. State the reason why nuclei undergo nuclear fission.**
4. **You are given two nucleoids**

$$^{7}_{3}X \quad \& \quad ^{4}_{3}Y$$

   (i) **Are they the isotopes of same element? Why?**
   (ii) **Which one of the two is likely to be more stable? Give reason.**
5. **Why is neutron so efficient as a bombardment particle?**
6. **How is moderator able to slow down fast moving neutrons in a nuclear reactor?**
7. **Explain the phenomena of fission. Give one representative equation.**
8. **Show that the nuclear density is same for all the nuclei.**
9. **Explain alpha decay giving an example.**
10. **Differentiate b\w artificial and induced radioactivity.**
11. **Briefly discuss the uses of a nuclear reactor.**
12. **A radioactive isotope has a half-life of T years. After how much time is its activity reduced to 6.25% of its original activity? (Ans : Binding energy = 104.72 MeV)**
13. **Obtain the binding energy of a nitrogen nucleus from the following data.**
    M_H = 1.00783 u; M_N = 1.00867 u
    M_n = 1.00867u
    Give your answer in MeV . (Ans: Binding energy = 104.72 MeV)
14. **Define mass no. (A) of an atomic nucleus. Assuming the nucleus to be spherical, give the relation b\w mass no. (A) and radius (R) of the nucleus.**

    Calculate the density of nuclear matter.
    Radius of nucleus of H = 1.1 x 10^{-15} A
    What is the ratio of the order of magnitude of density of nuclear matter and density of ordinary matter?
15. **The half life of a radioactive sample is 30 s. Calculate (1) the decay constant (2) time taken for sample to become ¼ of initial value. [Ans. (i) 0.02315^{-1} (ii) t = 60 Seconds)]**
16. **What is the power output of U reactor if it takes 30 days to use 2 Kg fuel, and if each fission gives 185 MeV of usable energy?**
17. **Calculate binding energy per nucleon of $_{83}Bi^{209}$. Given**
    m ($_{83}Bi^{209}$) = 208 . 980388 a.m.u
    m (neutron) = 1.008665 a.m.u
    m (Proton) = 1.007825 a.m.u [Ans B.E / Nucleon = 8.84 MeV]

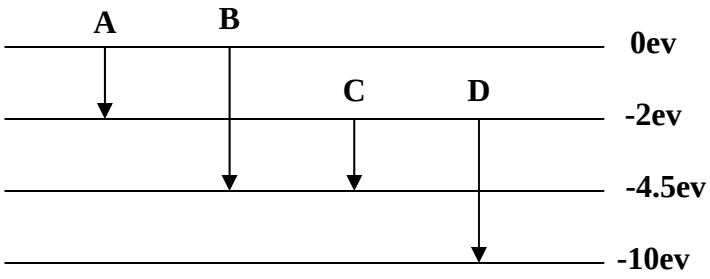
18. **A radioactive nuclear 'A' undergoes a series of decay according to following scheme :**

$$A \xrightarrow{\alpha} A_1 \xrightarrow{\beta} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$$

    The mass number and atomic number of A_4 are 172 & 69 respectively. What are these numbers for A?

19. **Two nuclei have mass numbers in the ratio 1 : 3 what is the ratio of their nuclear densities.**

20. **The energy levels of an atom are as shown below. Which of them will result in transition of a photon of wavelength 275 nm?**



Which transition corresponds to emission of radiation of maximum wavelength?