Board – CBSE	Class – 12	Topic – Nuclei

1 marks Question:

1. How is the mean life of a radioactive sample related to its half-life?
2. How is the radius of a nucleus related to its mass number?
3. A nucleus $^{238}_{92}\mathrm{U}$ undergoes α – decay and transforms to thorium. What is
   (i) The mass number and
   (ii) Atomic number of the nucleus produced?
4. Assuming the nuclei to be spherical in shape, how does the surface area of a nucleus of mass number A_1 compare with that of a nucleus of mass number A_2 ?
5. Out of the two characteristics, the mass number A and the atomic number Z of a nucleus, which one does not change during nuclear decay?

2 marks Question:

6. Calculate the kinetic energy and potential energy of an electron in the first orbit of hydrogen atom given $\mathrm{e} = 1.6 \times 10^{-19}\mathrm{C}$ and $\mathrm{r} = 0.53 \times 10^{-10}\mathrm{m}$
7. Show that nuclear density is in dependent of mass number A of a nucleus?
8. In both β^- and β^+ - decay process, the mass number of nucleus remains the same, whereas the atomic number Z increases by one in β^- -decay and decrease by one in β^+ -decay . Explain giving reasons. [foreign 2014]
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 100 yr and 50 yr, respectively. Find the time after which the amounts of A and B become equal. [Hots; Foreign 2012]
10. Draw a plot representing the law of radioactive decay. Define the activity of a sample of a radioactive nucleus. Write its SI unit. [Foreign 2008]
11. Explain giving necessary reactions, how energy is released during
    (i) Fission
    (ii) fusion [All India 2011 c]
12. (i) In a typical nuclear reaction, e.g.
    $^{2}_{1}\mathrm{H} + ^{2}_{1}\mathrm{H} \rightarrow ^{3}_{2}\mathrm{He} + \mathrm{n} + 3.27$

although number of nucleons is conserved yet energy of nucleons is conserved yet energy is released. How?

Explain(ii)show that nuclear density in a given nucleus is independent of mass number A.

13. Draw a plot of the binding energy per nucleon as a function of mass number for a large number of nuclei 20 > A > 240. How do you explain the constancy of binding energy per nucleon in the range of 30<A<170 using the property that nuclear force is short-ranged? [All India 2010]

5 marks Question

14. (i) Draw the plot of binding energy per nucleon (BE/A) as a function of mass number A. Write two important conclusions that Can be drawn regarding the nature of nuclear force.

    (ii) Use this graph to explain the release of energy in both the processes of nuclear fusion and fission.

    (iii)Write the basic nuclear process of neutron undergoing $\beta -$ declay,. Why is the detection of neutrinos found very difficult? [Hots; All India 2013]
15. Draw a plot of binding energy per nucleon (BE/A) versus mass number (A) for a large number of nuclei lying between 2 < A < 240. Using this graph, explain clearly how the energy is released in both the process of nuclear fission and fusion?