CHAPTER-13
Nuclei
ASSIGNMENT-1
MCQ

Q1. The mass number of a nucleus is

(a) Always less than its atomic number

(b) Always more than its atomic number

(c) Always equal to its atomic number

(d) Sometimes more than and sometimes equal to its atomic number

Q2. Nuclear binding energy is equivalent to

(a) Mass of proton

(b) Mass of neutron

(c) Mass of nucleus

(d) Mass defect of nucleus

Q3. In nuclear reaction, there is conservation of

(a) Mass only (b) Momentum only (c) Energy only (d) Mass, energy and momentum

Q4. Particles which can be added to the nucleus of an atom without changing its chemical properties are called

(a) Neutrons (b) Electrons (c) Protons (d) Alpha particles

Q5. The radius of a nucleus is

(a) Directly proportional to its mass number

(b) Inversely proportional to its atomic weight

(c) Directly proportional to the cube root of its mass number

(d) None of these

Q6. The mass of an atomic nucleus is less than the sum of the masses of its constituents. This mass defect is converted into

(a) Heat energy (b) Light energy (c) Electrical energy (d) Energy which binds nucleons together

Q7. The neutrons and protons are collectively called as

a) Neutrons (b) Mass (c) Nucleons (d) None

ASSERTION AND REASON QUESTIONS

Read the assertion and reason carefully to mark the correct option out of the options given below:

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(c) If assertion is true but reason is false.

(d) If the assertion and reason both are false.

(e) If assertion is false but reason is true

Q8. Assertion : Density of all the nuclei is same.

Reason : Radius of nucleus is directly proportional to the cube root of mass number

Q9. Assertion : All the radioactive elements are ultimately converted in lead.

Reason : All the elements above lead are unstable

Q10. Assertion : The mass of a nucleus can be either less than or more than the sum of the masses of nucleons present in it.

Reason : The whole mass of the atom is considered in the nucleus.

2 MARKS QUESTIONS

Q11. Why are heavy nuclei usually unstable?

Q12. Write two characteristic features of nuclear force which distinguish it from Coulomb's force

Q13. Why do stable nuclei never have more protons than neutrons?

Q14. Distinguish between isotopes and isobars. Give one example for each of the species.

3-MARKS QUESTIONS

Q 15. Define nuclear fusion. Nuclear fusion is not possible in laboratory. Explain.

Q16. Calculate binding energy per nucleon of $^{56}Fe_{26}$ nucleus. Given that mass of $^{56}Fe_{26}$ = 55.934939u, mass of proton = 1.007825u, mass of neutron = 1.008665 u and 1 u = 931 MeV.

1) $^{3}He_{2}$ and $^{3}H_{1}$ nuclei have same mass number. Do they have the same Binding energy Explain
2) If both the number of neutrons and the numbers of protons are conserved in each nuclear reaction, in what way is mass converted into energy in a nuclear reaction? Explain

5-MARKS QUESTIONS

Q 17. Distinguish between nuclear fission and fusion. Show how both these processes energy is released. Calculate the energy release in MeV in the deuterium-tritium fusion reaction

$_1H^2 + _1H^3 \rightarrow _2He^4 + n$

using the data mass of $_1H^2$= 2.014102 u, mass of $_1H^3$ = 3.016949 u, mass of $_2He^4$ = 4.002603 u, mass of neutron = 1.008665 u, u = 931.5 MeV

Q18. i) What characteristic property of nuclear force explains the constancy of binding energy per nucleon (B.E/A) in the range of mass number 'A' lying 30<A< 170. ii) Show that the density of nucleus over a wide range of nuclei is constant independent of mass number A.

3-MARKS QUESTIONS- CASE STUDY

Q19. As per the population rise in our country, energy demand is also increasing especially the electrical energy. For fulfilment of such demand, one of the option is to utilize nuclear sources. Nuclear energy is obtained through the nuclear fission process, where a bi nucleus gets split into two or more than two smaller nuclei along with tremendous amount of energy. This energy can be used for either constructive purpose or destructive purpose for the humans. Nuclear reaction is of two types- nuclear fission and nuclear fusion. In nuclear reactor, controlled nuclear fission reaction is carried out.

(I) The process taking out in the sun, due which we get light and heat energy

(A) Nuclear fission (B) Nuclear fusion (C) Thermal reactions (D) Nuclear holocaust

(II) The atomic energy programme in our country was launched under the leadership of

(A) C V Raman (B) H J Bhabha (C) A P J Abdul Kalam (D) Amit Bhatnagar

(III) The temperature of the core of the sun is about

(A) 10^3 to 10^4 K (B) 10^6 to 10^7 K (C) 10^9 to 10^{10} K (D) None of the above

(IV) To slow down the fast moving neutrons in nuclear reactor by

(A) Control rods (B) Moderator (C) Coolant (D) Plasamon.

Q 20. ***Read the passage given below and answer the following questions:***

Neutrons and protons are identical particle in the sense that their masses are nearly the same and the force, called nuclear force, does into distinguish them. Nuclear force is the strongest force. Stability of nucleus is determined by the neutron proton ratio or mass defect or packing fraction. Shape of nucleus is calculated by quadrupole moment and spin of nucleus depends on even and odd mass number. Volume of nucleus depends on the mass number. Whole mass of the atom (nearly 99%) is centred at the nucleus

(I) The correct statements about the nuclear force is/are

(a) charge independent

(b) short range force

(c) non-conservative force

(d) all of these.

(II) The range of nuclear force is the order of

(a) 2×10^{-10} m (b) 1.5×10^{-20} m (c) 1.2×10^{-4} m (d) 1.4×10^{-15} m

(III) A force between two protons is same as the force between proton and neutron. The nature ofthe force is

(a)Electrical force (b) weak nuclear force (c) gravitational force (d) strong nuclear force

(IV) All the nucleons in an atom are held by

(a) nuclear forces (b) vander waal's forces (c) tensor forces (d) coulomb forces