

Nuclear and Radioactivity Assignment (II)

- Outside a nucleus
 - Neutron is stable
 - Proton and neutron both are stable
 - Neutron is unstable
 - Neither neutron nor proton is stable
- Nuclear force is
 - Short range and charge dependent
 - Short range and charge independent
 - Long range and charge independent
 - Long range like electrostatic type
- In ${}_{88}\text{Ra}^{226}$ nucleus there are
 - 138 protons and 88 neutrons
 - 138 neutrons and 88 protons
 - 226 protons and 88 electrons
 - 226 neutrons and 138 electrons
- Atomic weight of Boron is 10.81 and it has two isotopes ${}_{5}\text{B}^{10}$ and ${}_{5}\text{B}^{11}$. Then the ratio of ${}_{5}\text{B}^{10} : {}_{5}\text{B}^{11}$ in nature would be
 - 19 : 81
 - 10 : 11
 - 15 : 18
 - 81 : 19
- Atoms whose nuclei contain different number of protons but same number of neutrons are called
 - Isotopes
 - Isotones
 - Isobars
 - Isoclinics
- r_1 and r_2 are the radii of atomic nuclei of mass numbers 64 and 27 respectively. The ratio $\frac{r_1}{r_2}$ is
 - $\frac{64}{27}$
 - $\frac{27}{64}$
 - $\frac{4}{3}$
 - 1
- A nucleus ruptures into two nuclear parts which have their velocity ratio equal to 2 : 1. What will be the ratio of their nuclear size (nuclear radius)
 - $2^{1/3} : 1$
 - $1 : 2^{1/3}$
 - $3^{1/2} : 1$
 - $1 : 3^{1/2}$
- Two nuclei are said to be mirror nuclei if
 - Number of protons in the two nuclei are equal
 - Number of neutrons in the two are equal
 - Number of neutrons in one equals number of protons in the other and *vice-versa*
 - The number of nucleons in the two are equal
- The mass number of helium and sulphur are 4 and 32 respectively. The nucleus of sulphur is then how many times greater than the *He* nucleus
 - $\sqrt{8}$
 - 4
 - 3
 - 2
- What is the radius of iodine atom (Atomic number 53, mass number 126)
 - $2.5 \times 10^{-11} \text{ m}$
 - $2.5 \times 10^{-9} \text{ m}$
 - $7 \times 10^{-9} \text{ m}$
 - $7 \times 10^{-6} \text{ m}$
- ${}_{1}\text{H}^1$ and ${}_{1}\text{H}^3$ are examples of
 - Isobars
 - Isotones
 - Isotopes
 - Isodiapheres
- Mass numbers of two isotopes *A* and *B* are 14 and 16 respectively. If 7 electron are present in the atom *A*, then the number of neutrons in the nucleus of atom *B* are
 - 2
 - 7
 - 9
 - 16
- When a neutron is disintegrated, it gives
 - One proton, one electron and one neutrino
 - One positron, one electron and one anti-neutrino
 - One proton, one positron and one neutrino
 - One proton, γ rays and one neutrino
- "Mass density" of nucleus varies with its mass number *A* as
 - A^2
 - A
 - A^0
 - $1/A$
- The radius of the nucleus with nucleon number 2 is $1.5 \times 10^{-15} \text{ m}$, then the radius of nucleus with nucleon number 54 will be
 - $3 \times 10^{-15} \text{ m}$
 - $4.5 \times 10^{-15} \text{ m}$
 - $6 \times 10^{-15} \text{ m}$
 - $9 \times 10^{-15} \text{ m}$
- If F_{pp} , F_{pn} and F_{nn} are the magnitudes of net force between proton-proton, proton-neutron and neutron-neutron respectively, then
 - $F_{pp} = F_{pn} = F_{nn}$
 - $F_{pp} < F_{pn} = F_{nn}$
 - $F_{pp} > F_{pn} > F_{nn}$
 - $F_{pp} < F_{pn} < F_{nn}$
- A nucleus ${}_Z\text{X}^A$ emits 2α -particles and 3β -particles. The ratio of total protons and neutrons in the final nucleus is
 - $\frac{Z-7}{A-Z+7}$
 - $\frac{Z-1}{A-Z-8}$
 - $\frac{Z-1}{A-Z-7}$
 - $\frac{Z-3}{A-Z+3}$
- M_p denotes the mass of a proton and M_n that of a neutron. A given nucleus, of binding energy *B*, contains *Z* protons and *N* neutrons. The mass *M*(*N*, *Z*) of the nucleus is given by (*c* is the velocity of light)
 - $M(N, Z) = NM_n + ZM_p - BC^2$
 - $M(N, Z) = NM_n + ZM_p + BC^2$

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- (c) $M(N, Z) = NM_n + ZM_p - B/C^2$ (d) $M(N, Z) = NM_n + ZM_p + B/C^2$
19. The binding energy of nucleus is a measure of its
 (a) Charge (b) Mass (c) Momentum (d) Stability
20. If M is the atomic mass and A is the mass number, packing fraction is given by
 (a) $\frac{A}{M-A}$ (b) $\frac{A-M}{A}$ (c) $\frac{M}{M-A}$ (d) $\frac{M-A}{A}$
21. When an electron-positron pair annihilates, the energy released is about
 (a) $0.8 \times 10^{-13} J$ (b) $1.6 \times 10^{-13} J$ (c) $3.2 \times 10^{-13} J$ (d) $4.8 \times 10^{-13} J$
22. The atomic mass unit (amu) is equivalent to energy
 (a) 93.1 eV (b) 931 MeV (c) 931 keV (d) 931 eV
23. Sun radiates energy in all the directions. The average energy received by earth is $1.4 kW/m^2$. The average distance between the earth and the sun is $1.5 \times 10^{11} m$. The average mass in kg lost per day by the sun is (1 day = 86400 sec) (QBP 279)
 (a) 4.4×10^9 (b) 7.6×10^{14} (c) 3.8×10^{12} (d) 3.8×10^{14}
24. The nuclear reaction ${}^2H + {}^2H \rightarrow {}^4He$ (mass of deuteron = 2.0141 a.m.u. and mass of He = 4.0024 a.m.u.) is
 (a) Fusion reaction releasing 24 MeV energy (b) Fusion reaction absorbing 24 MeV energy
 (c) Fission reaction releasing 0.0258 MeV energy (d) Fission reaction absorbing 0.0258 MeV energy
25. A deuteron is bombarded on ${}_8O^{16}$ nucleus and α -particle is emitted. The product nucleus is
 (a) ${}_7N^{13}$ (b) ${}_5B^{10}$ (c) ${}_4Be^9$ (d) ${}_7N^{14}$
26. ${}^{22}Ne$ nucleus after absorbing energy decays into two α -particles and an unknown nucleus. The unknown nucleus is
 (a) Nitrogen (b) Carbon (c) Boron (d) Oxygen
27. In atom bomb the reaction which occurs is
 (a) Fusion (b) Controlled fission (c) Uncontrolled fission (d) Thermonuclear
28. In an atomic bomb, the energy is released due to
 (a) Chain reaction of neutrons and ${}_{92}U^{235}$ (b) Chain reaction of neutrons and ${}_{92}U^{238}$
 (c) Chain reaction of neutrons and ${}_{92}Pu^{240}$ (d) Chain reaction of neutrons and ${}_{92}U^{236}$
29. A nucleus with $Z = 92$ emits the following in a sequence :
 $\alpha, \beta^-, \beta^-, \alpha, \alpha, \alpha, \alpha, \beta^-, \beta^-, \alpha, \beta^+, \beta^+, \alpha$. The Z of the resulting nucleus is
 (a) 74 (b) 76 (c) 78 (d) 82
30. Radioactive nuclei that are injected into a patient collect at certain sites within its body, undergoing radioactive decay and emitting electromagnetic radiation. These radiations can then be recorded by a detector. This procedure provides an important diagnostic tool called
 (a) Gamma camera (b) CAT scan (c) Radiotracer technique (d) Gamma ray spectroscopy
31. Which of the following cannot be emitted by radioactive substances during their decay
 (a) Electrons (b) Protons (c) Neutrinos (d) Helium nuclei
32. At a specific instant emission of radioactive compound is deflected in a magnetic field. The compound can emit
 (i) Electrons (ii) Protons (iii) He^{2+} (iv) Neutrons
 The emission at the instant can be
 (a) i, ii, iii (b) i, ii, iii, iv (c) iv (d) ii, iii
33. Read the following statements and identify the correct one
 (i) Radioactive decay obeys the law of exponential
 (ii) Electrons orbiting the nucleus are responsible for radioactivity
 (iii) Half life period is greater than mean life period
 (iv) After disintegration radio carbon is converted into N-14
 (a) (i), (ii) correct and (iii), (iv) false (b) (i), (ii), (iv) correct and (iii) false
 (c) (i), (ii), (iii) and (iv) are correct (d) (i), (iv) correct and (ii), (iii) false
34. If ${}_{92}U^{238}$ undergoes successively 8 α -decays and 6 β -decays, then resulting nucleus is
 (a) ${}_{82}U^{206}$ (b) ${}_{82}Pb^{206}$ (c) ${}_{82}U^{210}$ (d) ${}_{82}U^{214}$
35. In the given reaction ${}_zX^A \rightarrow {}_{z+1}Y^A \rightarrow {}_{z-1}K^{A-4} \rightarrow {}_{z-1}K^{A-4}$
 Radioactive radiations are emitted in the sequence

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- (a) α, β, γ (b) β, α, γ (c) γ, α, β (d) β, γ, α
36. A nucleus ${}_n X^m$ emits one α and one β particles. The resulting nucleus is
 (a) ${}_n X^{m-4}$ (b) ${}_{n-2} Y^{m-4}$ (c) ${}_{n-4} Z^{m-4}$ (d) ${}_{n-1} Z^{m-4}$
37. In radioactive element, β -rays emits from
 (a) Nucleus (b) Outer-orbit (c) Inner-orbit (d) None of these
38. The equation ${}_z X^A \rightarrow {}_{z+1} Y^A + {}_{-1} e^0 + \bar{\nu}$ is
 (a) β -emission (b) α -emission (c) e^- capture (d) Fission
39. A π^0 at rest decays into 2γ rays $\pi^0 \rightarrow \gamma + \gamma$. Then which of the following can happen
 (a) The two γ 's move in same direction (b) The two γ 's move in opposite direction
 (c) Both repel each other (d) Both attract each other
40. A radioactive substance emits
 (a) Electromagnetic radiation (b) Electrons revolving around the nucleus
 (c) Charged particles (d) Neutral particles
41. Which of the following processes represents a gamma-decay
 (a) ${}^A X_z + \gamma \rightarrow {}^A X_{z-1} + a + b$ (b) ${}^A X_Z + {}^1 n_0 \rightarrow {}^{A-3} X_{Z-2} + c$ (c) ${}^A X_Z \rightarrow {}^A X_Z + f$ (d) ${}^A X_Z + e_{-1} \rightarrow {}^A X_{Z-1} + g$
42. The S.I. unit of radioactivity is
 (a) Roentgen (b) Rutherford (c) Curie (d) Becqueral
43. The decay constant of a radioactive element is 0.01 per sec. Its half life period is
 (a) 693 sec (b) 6.93 sec (c) 0.693 sec (d) 69.3 sec
44. The half-life of Bi^{210} is 5 days. In the seven samples out of eight, the time required for decay is
 (a) 3.4 days (b) 10 days (c) 15 days (d) 20 days
45. 99% of a radioactive element will decay between
 (a) 6 and 7 half lives (b) 7 and 8 half lives (c) 8 and 9 half lives (d) 9 half lives
46. Certain radioactive substance reduces to 25% of its value in 16 days. Its half-life is
 (a) 32 days (b) 8 days (c) 64 days (d) 28 days
47. The decay constant of a radioactive element is 1.5×10^{-9} per second. Its mean life in seconds will be
 (a) 1.5×10^9 (b) 4.62×10^8 (c) 6.67×10^8 (d) 10.35×10^8
48. Three fourth of the active decays in a radioactive sample in $3/4$ sec. The half life of the sample is
 (a) $\frac{1}{2}$ sec (b) 1 sec (c) $\frac{3}{8}$ sec (d) $\frac{3}{4}$ sec
49. A freshly prepared radioactive substance of half-life half an hour emits radiation of intensity thirty two times the permissible safe limit. The minimum time after which it would be safe to work with the substance is
 (a) 3 hours (b) $\frac{5}{2}$ hours (c) 2 hours (d) 8 hours
50. The half-life of ${}^{131} I$ is 8 days. Given a sample of ${}^{131} I$ at time $t = 0$, we can assert that
 (a) No nucleus will decay before $t = 4$ days (b) No nucleus will decay before $t = 8$ days
 (c) All nuclei will decay before $t = 16$ days (d) A given nucleus may decay at any time after $t = 0$