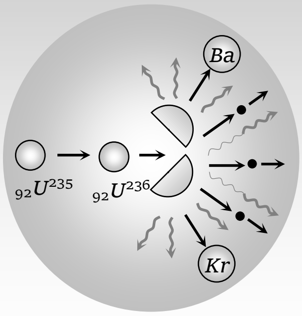


Assignment

Nucleus

1. For effective nuclear forces, the distance should be **[Similar to (CPMT 2002); Orissa PMT 2004]**

(a) $10^{-10}\ m$ (b) $10^{-13}\ m$ (c) $10^{-15}\ m$ (d) $10^{-20}\ m$

2. Mark the correct statement **[MP PMT 2004]**

(a) Nuclei of different elements can have the same number of neutrons

(b) Every element has only two stable isotopes

(c) Only one isotope of each element is stable

(d) All isotopes of every element are radioactive

3. For uranium nucleus how does its mass vary with volume

(a) $m \propto V$ (b) $m \propto 1/V$ (c) $m \propto \sqrt{V}$ (d) $m \propto V^2$

4. The order of radius of the nucleus of an atom is **[MP PET 2002]**

(a) $10^{-10}\ m$ (b) $10^{-12}\ m$ (c) $10^{-15}\ m$ (d) $10^{-17}\ m$

5. Two protons exert a nuclear force on each other, the distance between them is **[CPMT 2002]**

(a) $10^{-14}\ m$ (b) $10^{-10}\ m$ (c) $10^{-12}\ m$ (d) $10^{-8}\ m$

6. Oxygen is more stable than nitrogen because **[TNPCEE 2002]**

(a) Atomic number of oxygen is greater than that of nitrogen (b) The atomic weight of oxygen is less when compared to iron

(c) Oxygen helps burning (d) Oxygen has equal number of protons and neutrons

7. The sodium nucleus $^{23}_{11}Na$ contains

(a) 11 electrons (b) 12 protons (c) 23 protons (d) 12 neutrons

8. The electron emitted in beta radiation originates from **[IIT-JEE (Screening) 2001]**

(a) Inner orbits of atoms (b) Free electrons existing in nuclei

(c) Decay of a neutron in a nucleus (d) Photon escaping from the nucleus

9. The mass number of a nucleus is always **[MH CET 2001]**

(a) Equal to atomic number (b) Less than atomic number (c) More than atomic number (d) Either (a) or (c)

10. In the given particles, which of the following is stable **[CPMT 2000]**

(a) Electron (b) Proton (c) Positron (d) Neutron

11. 1 *amu* is equal to (QBP-64) **[CPMT 2000]**

(a) 1 g (b) 4.8×10^{-10} esu (c) 6.023×10^{23} g (d) 1.66×10^{-27} kg

12. The density of nucleus in kg/m^3 is of the order of **[MP PMT 2000]**

(a) 10^4 (b) 10^9 (c) 10^{13} (d) 10^{17}

13. Fertile material among the following is **[KCET 1999]**

(a) U^{233} (b) U^{238} (c) U^{235} (d) Pu^{239}

14. The force between a neutron and a proton inside the nucleus is

(a) Only nuclear attractive (b) Only Coulomb force (c) Both of the above (d) None of these

15. Outside a nucleus **[MP PET 1999]**

(a) Neutron is stable (b) Proton and neutron both are stable

(c) Neutron is unstable (d) Neither neutron nor proton is stable

16. Nuclear force is **[EAMCET (Med.) 1998; CPMT 1999]**

(a) Short range and charge dependent (b) Short range and charge independent

(c) Long range and charge independent (d) Long range like electrostatic type

17. In $_{88}Ra^{226}$ nucleus there are

(a) 138 protons and 88 neutrons (b) 138 neutrons and 88 protons

(c) 226 protons and 88 electrons (d) 226 neutrons and 138 electrons

18. Atomic weight of Boron is 10.81 and it has two isotopes $_5B^{10}$ and $_5B^{11}$. Then the ratio of $_5B^{10}$: $_5B^{11}$ in nature would be **[CBSE PMT 1998]**

(a) 19 : 81 (b) 10 : 11 (c) 15 : 18 (d) 81 : 19

19. Atoms whose nuclei contain different number of protons but same number of neutrons are called

(a) Isotopes (b) Isotones (c) Isobars (d) Isoclinics

20. 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

(a) $\frac{64}{27}$ (b) $\frac{27}{64}$ (c) $\frac{4}{3}$ (d) 1

21. 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)

(a) $2^{1/3}:1$ (b) $1:2^{1/3}$ (c) $3^{1/2}:1$ (d) $1:3^{1/2}$

22. Two nuclei are said to be mirror nuclei if **[AFMC 1994]**

(a) Number of protons in the two nuclei are equal

(b) Number of neutrons in the two are equal

(c) Number of neutrons in one equals number of protons in the other and *vice-versa*

(d) The number of nucleons in the two are equal

23. 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

(a) $\sqrt{8}$ (b) 4 (c) 3 (d) 2

24. What is the radius of iodine atom (Atomic number 53, mass number 126) **[CBSE PMT 1993]**

(a) $2.5\times10^{-11}\,m$ (b) $2.5\times10^{-9}\,m$ (c) $7\times10^{-9}\,m$ (d) $7\times10^{-6}\,m$

25. ${}_1H^1$ and ${}_1H^3$ are examples of

(a) Isobars (b) Isotones (c) Isotopes (d) Isodiapheres

26. 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 **[MP PMT 1992]**

(a) 2 (b) 7 (c) 9 (d) 16

27. When a neutron is disintegrated, it gives **[MP PMT 1992]**

(a) One proton, one electron and one neutrino (b) One positron, on electron and one anti-neutrino

(c) One proton, one positron and one neutrino (d) One proton, γ rays and one neutrino

28. "Mass density" of nucleus varies with its mass number *A* as

(a) A^2 (b) A (c) A^0 (d) $1/A$

29. The radius of the nucleus with nucleon number 2 is $1.5\times10^{-15}\,m$, then the radius of nucleus with nucleon number 54 will be

(a) $3\times10^{-15}\,m$ (b) $4.5\times10^{-15}\,m$ (c) $6\times10^{-15}\,m$ (d) $9\times10^{-15}\,m$

30. If F_{pp}, F_{pm} and F_{nn} are the magnitudes of net force between proton-proton, proton-neutron and neutron-neutron respectively, then

(a) $F_{pp}=F_{pn}=F_{nn}$ (b) $F_{pp}<F_{pn}=F_{nn}$ (c) $F_{pp}>F_{pn}>F_{nn}$ (d) $F_{pp}<F_{pn}<F_{nn}$

31. A nucleus ${}_ZX^A$ emits 2α-particles and 3β-particles. The ratio of total protons and neutrons in the final nucleus is

(a) $\frac{Z-7}{A-Z+7}$ (b) $\frac{Z-1}{A-Z-8}$ (c) $\frac{Z-1}{A-Z-7}$ (d) $\frac{Z-3}{A-Z+3}$

Mass defect & Binding energy

32. 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)

(a) $M(N,Z)=NM_n+ZM_p-BC^2$ (b) $M(N,Z)=NM_n+ZM_p+BC^2$

(c) $M(N,Z)=NM_n+ZM_p-B/C^2$ (d) $M(N,Z)=NM_n+ZM_p+B/C^2$

33. The binding energy of nucleus is a measure of its **[MP PET 2004]**

(a) Charge (b) Mass (c) Momentum (d) Stability

34. If *M* is the atomic mass and *A* is the mass number, packing fraction is given by **[KCET 2004]**

(a) $\frac{A}{M-A}$ (b) $\frac{A-M}{A}$ (c) $\frac{M}{M-A}$ (d) $\frac{M-A}{A}$

35. When an electron-positron pair annihilates, the energy released is about

[MP PET/PMT 1988; CBSE 1992; MP PMT 1994; RPET 1997; RPMT 2000; AIIMS 2004]

(a) $0.8\times10^{-13}\,J$ (b) $1.6\times10^{-13}\,J$ (c) $3.2\times10^{-13}\,J$ (d) $4.8\times10^{-13}\,J$

36. The atomic mass unit (*amu*) is equivalent to energy **[Similar to CPMT 2001; MP PET/PMT 2001; MP PMT 2004]**

(a) 93.1 *eV* (b) 931 *MeV* (c) 931 *keV* (d) 931 *eV*

37. 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 × 10^{11} *m*. The average mass in *kg* lost per day by the sun is (1 day = 86400 *sec*) (QBP 279) **[MP PMT 1993, 2003]**

(a) 4.4 × 10^9 (b) 7.6 × 10^{14} (c) 3.8 × 10^{12} (d) 3.8 × 10^{14}

38. Energy obtained when 1 *mg* mass is completely converted to energy is

(a) $3\times10^8 J$ (b) $3\times10^{10} J$ (c) $9\times10^{13} J$ (d) $9\times10^{15} J$

39. The energy liberated on complete fission of 1 *kg* of $_{92}U^{235}$ is (Assume 200 *MeV* energy is liberated on fission of 1 nucleus)

[RPET 1999, 2000; UPSEAT 2003]

(a) 8.2 × 10^{10} *J* (b) 8.2 × 10^9 *J* (c) 8.2 × 10^{13} *J* (d) 8.2 × 10^{16} *J*

40. The mass defect in a particular nuclear reaction is 0.3 *gm*. The amount of energy liberated in kilowatt hours is (Velocity of light = 3 × 10^8 *m/s*)

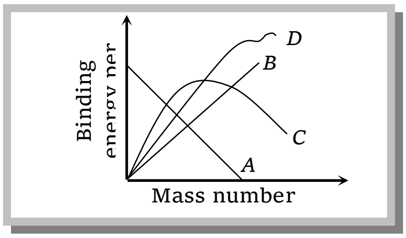
(a) 1.5×10^6 (b) 2.5×10^6 (c) 3×10^6 (d) 7.5×10^6

41. The binding energy per nucleon is maximum in the case of

(a) $^{2}_{4}He$ (b) $^{56}_{26}Fe$ (c) $^{141}_{56}Ba$ (d) $^{235}_{92}U$

42. Binding energy per nucleon plot against the mass number for stable nuclei is shown in the figure. Which curve is correct

[Orissa JEE 2002]



(a) *A*

(b) *B*

(c) *C*

(d) *D*

43. The rest mass of an electron as well as that of positron is 0.51 *MeV*. When an electron and positron are annihilate, they produce gamma-rays of wavelength(s)

(a) 0.012 Å (b) 0.024 Å (c) 0.012 Å to ∞ (d) 0.024 Å to ∞

44. If the energy released in the fission of one nucleus is $3.2\times10^{-11} J$, then number of nuclei required per second in a power plant of 16 *kW* is **[KCET 2000; CPMT 2001]**

(a) 5×10^{14} (b) 5×10^{12} (c) 0.5×12^{12} (d) 0.5×10^{14}

45. M_n and M_p represent mass of neutron and proton respectively. If an element having atomic mass *M* has *N*-neutron and *Z*-proton, then the correct relation will be

(a) $M<[NM_n+ZM_p]$ (b) $M>[NM_n+ZM_p]$ (c) $M=[NM_n+ZM_p]$ (d) $M=N[M_n+M_p]$

46. An element has binding energy 8 *eV/nucleon*. If it has total binding energy 128 *eV*, then the number of nucleons are (QBP 314)

[CPMT 2001]

(a) 8 (b) 14 (c) 16 (d) 32

47. If the binding energy per nucleon in Li^7 and He^4 nuclei are respectively 5.60 *MeV* and 7.06 *MeV*, then energy of reaction $Ll^7+p\rightarrow 2\ _2He^4$ is **[CBSE 1994; JIPMER 2000]**

(a) 19.6 *MeV* (b) 2.4 *MeV* (c) 8.4 *MeV* (d) 17.3 *MeV*

48. If 200 *MeV* energy is released in the fission of a single U^{235} nucleus, the number of fissions required per second to produce 1 *Kilowatt* power shall be (Given 1 *eV* = 1.6 × 10^{-19} *J*)

(a) 3.125 × 10^{13} (b) 3.125 × 10^{14} (c) 3.125 × 10^{15} (d) 3.125 × 10^{16}

49. M_P = 1.008 *amu*, Mn = 1.009 *amu* and $M\ _2He^4=4.003$ *amu* then the binding energy of α-particle is

(a) 21.4 *MeV* (b) 8.2 *MeV* (c) 34 *MeV* (d) 28.8 *MeV*

50. The rest energy of an electron is 0.511 *MeV*. The electron is accelerated from rest to a velocity 0.5 *c*. The change in its energy will be

[MP PET 1996]

(a) 0.026 *MeV* (b) 0.051 *MeV* (c) 0.079 *MeV* (d) 0.105 *MeV*

51. The binding energy per nucleon of O^{16} is 7.97 *MeV* and that of O^{17} is 7.75 *MeV*. The energy (in *MeV*) required to remove a neutron from O^{17} is

(a) 3.52 (b) 3.64 (c) 4.23 (d) 7.86

52. The binding energies per nucleon for a deuteron and an α-particle are x_1 and x_2 respectively. What will be the energy Q released in the reaction ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + Q$

(a) 4 $(x_1 + x_2)$ (b) 4 $(x_2 - x_1)$ (c) 2 $(x_1 + x_2)$ (d) 2 $(x_2 - x_1)$

53. A star initially has 10^{40} deuterons. It produces energy via the processes

$${}_1H^2 + {}_1H^2 \rightarrow {}_1H^3 + p$$

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

The masses of the nuclei are as follows : $M(H^2) = 2.014\ amu; M(p) = 1.007\ amu$;

$$M(n) = 1.008\ amu; M(He^4) = 4.001\ amu$$

If the average power radiated by the star is 10^{16} *W*. The deuteron supply of the star is exhausted in a time of the order of

[IIT-JEE 1993]

(a) 10^6 *sec* (b) 10^8 *sec* (c) 10^{12} *sec* (d) 10^{16} *sec*

54. If two nuclei of masses m_1 and m_2 fused to form a nucleus of mass m and some energy is released, then

(a) $(m_1 + m_2) > m$ (b) $(m_1 + m_2) < m$ (c) $m_1 + m_2 = m$ (d) $m_1 - m_2 = m$

55. What is the binding energy per nucleon of hydrogen nucleus

(a) 0 (b) ∞ (c) 7.5 *MeV* (d) 8.5 *MeV*

Nuclear reaction, Nuclear Fission and Nuclear Fusion

56. The function of the control rods in nuclear reactor is **[Similar to CPMT 2003; MP PET 2004]**

(a) Absorb neutrons (b) Accelerate neutrons (c) Slow down neutrons (d) No effect on neutrons

57. Complete the reaction $n + {}^{235}_{92}U \rightarrow {}^{144}_{56}Ba + ... + 3n$ **[Kerala PMT 2004]**

(a) ${}^{89}_{36}Kr$ (b) ${}^{90}_{36}Kr$ (c) ${}^{91}_{36}Kr$ (d) ${}^{92}_{36}Kr$

58. Heavy water is .... **[KCET 2004]**

(a) Water, in which soap does not lather (b) Compound of heavy oxygen and heavy hydrogen

(c) Compound of deuterium and oxygen (d) Water at 4°*C*

59. The nuclear reactor at Kaiga is a .... **[KCET 2004]**

(a) Breeder reactor (b) Power reactor (c) Research reactor (d) Fusion reactor

60. The principle of controlled chain reaction is used in **[Orissa JEE 2004]**

(a) Atomic energy reactor (b) Atom bomb (c) In the core of sun (d) Artificial radioactivity

61. In the following reaction the value of '*X*' is

${}_7N^{14} + {}_2He^4 \rightarrow X + {}_1H^1$ **[DPMT 1999; CPMT 2003]**

(a) ${}_8N^{17}$ (b) ${}_8O^{17}$ (c) ${}_7O^{16}$ (d) ${}_7N^{16}$

62. What was the fissionable material used in bomb dropped at Nagasaki (Japan) in the year 1945 **[MNR 1985; UPSEAT 2003]**

(a) Uranium (b) Nepturium (c) Berkalium (d) Plutonium

63. The atomic number and the mass number of an atom remains unchanged when it emits

(a) A photon (b) A neutron (c) β-particle (d) An α-particle

64. Light energy emitted by stars is due to **[MP PET 1985, 86; CPMT 1990; CBSE 1992; EAMCET (Engg.) 1995; RPET 1996; AFMC 1998; DCE 1999, 2000; Orissa JEE 2003]**

(a) Breaking of nuclei (b) Joining of nuclei (c) Burning of nuclei (d) Reflection of solar light

65. A nuclear reaction given by ${}_ZX^A \rightarrow {}_{Z+1}Y^A + {}_{-1}e^0 + \bar{p}$ represents

(a) γ-decay (b) Fusion (c) Fission (d) β-decay

66. Solar energy is mainly caused due to **[CBSE PMT 2003]**

(a) Fission of uranium present in the sun (b) Fusion of protons during synthesis of heavier elements

(c) Gravitational contraction (d) Burning of hydrogen in the oxygen

67. Find the wrong statement **[TNPCEE 2002]**

(a) Half-life of a neutron is 13 minutes

(b) The stability of a nucleus is determined by the number of neutrons present in it

(c) Both fast and slow neutrons are capable of penetrating a nucleus

(d) A free neutrons decays into a proton, an electron and positron

68. Fusion reaction is initiated with the help of **[DPMT 2002]**

(a) Low temperature (b) High temperature (c) Neutrons (d) Any particle

69. In nuclear fission the percentage of mass converted into energy is about

(a) 10% (b) 0.01% (c) 0.1% (d) 1%

70. If the speed of light were 2/3 of its present value, the energy released in a given atomic explosion will be decreased by a fraction

[CBSE PMT 2002; Kerala PET 2002; AFMC 2003]

(a) 2/3 (b) 4/9 (c) 3/4 (d) 5/9

71. Heavy water is used as moderator in a nuclear reactor. The function of the moderator is

[Similar to (IIT-JEE 1994); CBSE 1994; EAMCET (Engg.) 1995; AFMC 2001, 2002, 2003; CBSE PMT 2002; IIMS 2003]

(a) To control the energy released in the reactor (b) To absorb neutrons and stop chain reaction

(c) To cool the reactor faster (d) To slow down the neutrons to thermal energies

72. 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 **[Orissa JEE 2**

(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

73. A deutron is bombarded on ${}_8O^{16}$ nucleus and α–particle is emitted. The product nucleus is

(a) ${}_7N^{13}$ (b) ${}_5B^{10}$ (c) ${}_4Bc^9$ (d) ${}_7N^{14}$

74. ^{22}Ne nucleus after absorbing energy decays into two α–particles and an unknown nucleus. The unknown nucleus is

[IIT-JEE 1999; UPSEAT 2002]

(a) Nitrogen (b) Carbon (c) Boron (d) Oxygen

75. In atom bomb the reaction which occurs is **[BHU 2001]**

(a) Fusion (b) Controlled fission (c) Uncontrolled fission (d) Thermonuclear

76. In an atomic bomb, the energy is released due to **[AIIMS 2001]**

(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 $_{92}U^{236}$

77. In the reaction $X(n,\alpha)^7_3Li$, X will be

(a) $^{10}_5B$ (b) ^9_5B (c) $^{11}_4Be$ (d) ^2_4He

78. Energy released in nuclear fission is due to **[CBSE PM/PD 2001]**

(a) Few mass is converted into energy

(b) Total binding energy of fragments is more than the B.E. of parental element

(c) Total B.E. of fragments is less than the B.E. of parental element

(d) Total B.E. of fragments is equal to the B.E. of parental element

79. Which one is not possible **[CPMT 2001]**

(a) $_7N^{14} + {_0n^1} \to {_7N^{16}} + {_1H^1}$ (b) $_{16}S^{32} + {_1H^1} \to {_{17}Cl^{35}} + {_2He^4}$

(c) $_8O^{16} + {_0n^1} \to {_7N^{14}} + 3\,{_1H^1} + 2\,{_{-1}\beta^0}$ (d) $_1H^1 + {_1H^1} \to {_2He^4}$

80. $_{16}S^{32} + {_0n^1} \to X + {_2He^4}$, X is **[CPMT 2001]**

(a) $_{16}S^{28}$ (b) $_{14}N^7$ (c) $_{14}Si^{29}$ (d) $_{16}S^{29}$

81. The polonium isotope $^{210}_{84}Po$ is unstable and emits a 10 MeV alpha particle. The atomic mass of $^{210}_{84}Po$ is 209.983 U and that ^4_2He is 4.003 U. The atomic mass of the daughter nucleus is

(a) 210 U (b) 208 U (c) 82.0 U (d) None of these

82. When two deuterium nuclei fuse together to form a tritium nuclei, we get a **[EAMCET 1994; CPMT 2000; CPMT 2000]**

(a) Neutron (b) Deutron (c) α -particle (d) Proton

83. The average number of prompt neutrons produced per fission of U^{235} is **[MP PMT 2000]**

(a) More than 5 (b) 3 to 5 (c) 2 to 3 (d) 1 to 2

84. Nuclear fission experiments show that the neutrons split the uranium nuclei into two fragments of about same size. This process is accompanied by the emission of several **[CBSE 1994; SCRA 1994; DPMT 2000]**

(a) Protons and positrons (b) $\alpha -$particles (c) Neutrons (d) Protons and $\alpha -$particles

85. To generate a power of 3.2 *mega watt*, the number of fissions of U^{235} per minute is

(Energy released per fission = 200MeV, $1eV = 1.6 \times 10^{-19} J$)

(a) 6×10^{18} (b) 6×10^{17} (c) 10^{17} (d) 6×10^{16}

86. Atomic hydrogen has its life period of **[CBSE PMT 2000]**

(a) One day (b) A fraction of a second (c) One hour (d) One minute

87. It is possible to understand nuclear fission on the basis of the

(a) Meson theory of the nuclear forces (b) Proton-proton cycle
(c) Independent particle model of the nucleus (d) Liquid drop model of the nucleus

88. If E_1 is the energy released per unit mass in Nuclear fusion and E_2 that in nuclear fission then

(a) $E_1 < E_2$ (b) $E_1 > E_2$ (c) $E_1 = -E_2$ (d) $E_1 = E_2$

89. When $^{235}_{92}U$ is bombarded with one neutron, the fission occurs and the products are three neutrons, $^{94}_{36}Kr$, and **[UPSEAT**

(a) $^{139}_{54}Xe$ (b) $^{139}_{58}Ce$ (c) $^{139}_{56}Ba$ (d) $^{142}_{53}I$

90. In the carbon cycle, from which stars hotter than the Sun obtain their energy, the $^{12}_{6}C$ isotope

(a) Splits into three alpha particles (b) Fuse with another $_6C^{12}$ nucleus to form $_{12}Mg^{24}$

(c) Is completely converted into energy (d) Is regenerated at the end of the cycle

91. In the following nuclear reaction $_6C^{11} \to {}_5B^{11} + \beta^+ + X$ what does X stand for **[CEET 1998; CPMT 2000]**

(a) A proton (b) A neutron (c) A neutrino (d) An electron

92. Fusion reaction takes place at high temperature because **[CPMT 1980; SCRA 1996; RPET 1999]**

(a) Atoms are ionized at high temperature

(b) Molecules break-up at high temperature

(c) Nuclei break-up at high temperature

(d) Kinetic energy is high enough to overcome repulsion between nuclei

93. The average kinetic energy of the thermal neutrons is of the order of (Boltzmann's constant $K_B = 8 \times 10^{-5} eV$ / Kelvin)

[MP PET 1993; AMU (Engg.) 1999]

(a) 0.03 eV (b) 3 eV (c) 3 KeV (d) 3 MeV

94. The large scale destruction, that would be caused due to the use of nuclear weapons is called

(a) Nuclear holocaust (b) Thermo-nuclear reaction (c) Neutron reproduction factor (d)

95. Which of these is a fusion reaction

(a) $^1_3H + ^1_2H = ^2_4He + ^0_1n$ (b) $^{238}_{92}U \to ^{206}_{82}Pb + 8(^4_2He) + 6(^0_{-1}\beta)$

(c) $^{12}_{7}C \to ^{12}_{6}C + \beta^+ + \gamma$ (d) None of these

96. A photon of 1.7×10^{-13} *Joules* is absorbed by a material under special circumstances. The correct statements is **[MP PET**

(a) Electrons of the atom of absorbed material will go to the higher energy states

(b) Electron and positron pair will be created

(c) Only positron will be produced

(d) Photon-electric effect will occur and electron will be produced

97. Complete the equation for the following fission process **[CBSE 1998]**

$_{92}U^{235} + {}_0n^1 \to \ldots\ldots {}_{38}Kr^{90} + \ldots\ldots$

(a) $_{54}Xe^{143} + 3{}_0n^1$ (b) $_{54}Xe^{145}$ (c) $_{57}Xe^{142}$ (d) $_{54}Xe^{143} + {}_0n^1$

98. In the carbon cycle of fusion **[EAMCET (Engg.) 1998]**

(a) Four $_1H^1$ fuse to form $_2He^4$ and two positrons (b) Four $_1H^1$ fuse to form $_2He^4$ and two electrons

(c) Two ${}_1H^2$ fuse to form ${}_2He^4$ (d) Four ${}_1H^2$ fuse to form ${}_2He^4$ and two positrons

99. In the reaction ${}_7N^{14} + {}_2He^{14} \rightarrow {}_8O^{17} +_1 H^1$ the minimum energy of the α -particle is

($M_N = 14.00307$ amu, $M_{He} = 4.0026\ amu$ and $M_O = 16.99914\ amu, M_H = 1.00783\ amu$ and $1\ amu = 931\ MeV$)

[EAMCET (Engg.) 1998]

(a) 1.21 *MeV* (b) 1.62 *MeV* (c) 1.89 *MeV* (d) 1.96 *MeV*

100. A nuclear reaction $n \rightarrow p + e^{-1} + \bar{v}$, if masses of proton, neutron and electron are respectively 1.6725×10^{-27}, 1.6747×10^{-27} and $9 \times 10^{-31} kg$ then emitted energy will be **[RPET 1998]**

(a) 0.51 *MeV* (b) 0.73 *MeV* (c) 1.02 *MeV* (d) 4.21 *MeV*

101. For the construction of nuclear-bomb which of the following substances is taken **[CPMT 1998]**

(a) U-235 (b) Pu-239 (c) F-14 (d) Both (a) and (b)

102. (QBP-588) Consider the fission reaction ${}_{92}U^{236} \rightarrow X^{117} + Y^{117} + n + n$ *i.e.*, two nuclei of same mass number 117 are found plus two neutrons. The binding energy per nucleon of *X* and *Y* is 8.5 *MeV* whereas of U^{236} is 7.6 *MeV*. The total energy liberated will be about

[CPMT 1976; CBSE 1997]

(a) 2 *MeV* (b) 20 *MeV* (c) 200 *MeV* (d) 2000 MeV

103. The capacity of Tarapur Atomic Power Station is 200 *MW*. The energy produced at this station in one day will be

[NCERT 1975; RPET 1996]

(a) 200 *J* (b) 200 *M Cal.* (c) 1728×10^{10} *J* (d) None of these

104. A reaction between a proton and ${}_8O^{18}$ that produces ${}_9F^{18}$ must also liberate (QBP-740)

(a) ${}_0n^1$ (b) ${}_1e^0$ (c) ${}_1n^0$ (d) ${}_0e^1$

105. Which of the following statements is (are) correct **[IIT-JEE 1994]**

(a) The rest mass of a stable nucleus is less than the sum of the rest masses of its separated nucleons

(b) The rest mass of a stable nucleus is greater than the sum of the rest masses of its separated nucleon

(c) In nuclear fusion, energy is released by fusing two nuclei of medium mass (approximately 100 *amu*)

(d) In nuclear fission, energy is released by fragmentation of a very heavy nucleus

106. In the following reaction ${}_{12}Mg^{24} + {}_2He^4 \rightarrow {}_{14}Si^x + {}_0n^1$ x is

(a) 28 (b) 27 (c) 26 (d) 22

107. A slow neutron (*n*) is captured by a ${}^{235}_{92}U$ nucleus forming a highly unstable ${}^{236}_{92}U^*$ (where * denotes that the nucleus is in an excited state). The fission of the nucleus occurs by

(a) ${}^{236}_{92}U^* \rightarrow {}^{140}_{50}Sn + {}^{89}_{42}MO + 6n + Q$ (b) ${}^{236}_{92}U^* \rightarrow {}^{140}_{54}Xe + {}^{94}_{38}Sr + 4n + Q$

(c) ${}^{236}_{92}U^* \rightarrow {}^{144}_{52}Te + {}^{89}_{42}MO + 3n + Q$ (d) ${}^{236}_{92}U^* \rightarrow {}^{144}_{56}Ba + {}^{89}_{36}Kr + 3n + Q$

108. For an atomic reactor being critical the ratio (*r*) of the average number of neutrons produced and used in chain reaction

[NCERT 1990]

(a) Is less than one (b) Is equal to one

(c) Is greater than one (d) Depends upon the mass of the fissionable material

109. The following nuclear reaction shows : $4\,{}_1H^1 \rightarrow {}_2He^4 + 2\,{}_1e^0 + 26\,MeV$

(a) Fission (b) Fusion (c) Transformation of element (d)Scattering of $\alpha-$particle

110. Heavy water has molecular weight

(a) 20 (b) 18 (c) 19 (d) 36

111. Four physical quantities are listed in column I. Their values are listed in column II in a random order

Column I

(A) Thermal energy of air molecules at room temperature (B) Binding energy per nucleon of heavy nuclei

(C) X-ray photon energy (D) Photon energy of visible light

Column II

(E) 0.02 *eV* (F) 2 *eV* (G) 1 *keV* (H) 7 *MeV*

The correct matching of column I and column II is given by

(a) A – E, B – H, C – G, D – F (b) A – E, B – G, C – F, D – H (c) A – F, B – E, C – G, D – H (d) A – F, B – H, C – E, D –G

112. Most suitable element for nuclear fission is the element with atomic number near **[CPMT 1982]**

(a) 11 (b) 21 (c) 52 (d) 92

113. A free electron can give rise to the following decay (where γ is a quantum of E.M. field)

(a) $e^- \to e^+$ (b) $e^- \to e^- + \gamma$ (c) $e^- \to e^-$ (d) $e^- \to \mu^-$

114. Assuming that about 20 *MeV* of energy is released per fusion reaction ${}_1H^2 + {}_1H^2 \to {}_0n^1 + {}_2He^3$ then the mass of ${}_1H^2$ consumed per day in a fusion reactor of power 1 megawatt will approximately be

(a) 0.001 *g* (b) 0.1 *g* (c) 10.0 *g* (d) 1000 *g*

115. If mass of $U^{235} = 235.12142$ *amu*., mass of $U^{236} = 236.12305$ *amu* and mass of neutron = 1.008665 *amu*. Then the energy required to remove one neutron from the nucleus U^{236} is nearly about

(a) 75 *MeV* (b) 6.5 *MeV* (c) 1 *eV* (d) Zero

Radioactivity

116. A radioactive decay chain starts from ${}_{93}Np^{237}$ and produces ${}_{90}Th^{229}$ by successive emissions. The emitted particles can be **[MP PMT 2004]**

(a) Two α-particles and one β^- particle (b) Three β^+ particles

(c) One α particle and two β^+ particles (d) One α particle and two β^- particles

117. A radioactive nucleus undergoes a series of decay according to the scheme

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

If the mass number and atomic number of *A* are 180 and 72 respectively, then what are these number for A_4

[Roorkee 1986; CBSE PMT 1995; MP PET 2002; KCET 2003]

(a) 172 and 69 (b) 174 and 70 (c) 176 and 69 (d) 176 and 70

118. Which of the following is in the increasing order for penetrating power

(a) α, β, γ (b) β, α, γ (c) γ, α, β (d) γ, β, α

119. Which of the following is a correct statement **[IIT-JEE 1999; DPMT 2000; UPSET 2003]**

(a) Beta rays are same as cathode rays (b) Gamma rays are high-energy neutrons

(c) Alpha particles are singly ionized helium atoms (d) Protons and neutrons have exactly the same mass

120. The rate of disintegration of fixed quantity of a radioactive element can be increased by **[MP PMT 1997, 2003]**

(a) Increasing the temperature (b) Increasing the pressure (c) Chemical reaction (d)

121. An element *A* decays into element *C* by a two step process **[MP PMT 1997, 2003]**

$A \to B + {}_2He^4$

$B \to C + 2e^-$, then **[CBSE 1994; AMU 2002; KCET 2003]**

(a) *A* and *C* are isotopes (b) *A* and *C* are isobars (c) *A* and *B* are isotopes (d) *A* and *B* are isobars

122. In the disintegration series ${}^{238}_{92}U \xrightarrow{\alpha} X \xrightarrow{\beta-} {}^{A}_{Z}Y$ the value of Z and A respectively will be

[MP PET/PMT 2001; DPMT 2002; MP PMT 2003]

(a) 92, 236 (b) 88, 230 (c) 90, 234 (d) 91, 234

123. The α-particle is the nucleus of an atom of **[CBSE 1999; RPET 2000; AFMC 2003 MP PET 2003]**

(a) Neon (b) Hydrogen (c) Helium (d) Deuterium

124. An atomic nucleus ${}_{90}Th^{232}$ emits several α and β radiations and finally reduces to ${}_{82}Pb^{208}$. It must have emitted

[RPMT 1998; MP PET 2003]

(a) 4α and 2β (b) 6α and 4β (c) 8α and 24β (d) 4α and 16β

125. Which of the following radiations has the least wavelength

(a) *X*-rays (b) γ–rays (c) β–rays (d) α–rays

126. In a material medium, when a positron meets an electron both the particles annihilate leading to the emission of two gamma ray photons. This process forms the basis of an important diagnostic procedure called

(a) MRI (b) PET (c) CAT (d) SPECT

127. Which of the following rays are not electromagnetic waves

(a) γ-rays (b) β-rays (c) Heat rays (d) X-rays

128. A nucleus with Z = 92 emits the following in a sequence :

$\alpha, \beta^-, \beta^-, \alpha, \alpha, \alpha, \alpha, \alpha, \beta^-, \beta^-, \alpha, \beta^+ \beta^+, \alpha$. The *Z* of the resulting nucleus is **[AIEEE 2003]**

(a) 74 (b) 76 (c) 78 (d) 82

129. 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

130. Which of the following cannot be emitted by radioactive substances during their decay

[Haryana PMT 2000; AIEEE 2003]

(a) Electrons (b) Protons (c) Neutrinoes (d) Helium nuclei

131. 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

132. 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

133. 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) $_{82}U^{214}$

134. 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 **[AIIMS 1982; CBSE 1993; AFMC 1999; MP PET 2002]**

(a) α, β, γ (b) β, α, γ (c) γ, α, β (d) β, γ, α

135. A nucleus $_nX^m$ emits one α and one β particles. The resulting nucleus is

[Similar to (Kerala PMT 2002); CBSE 1998; BHU 2001; AFMC 2002]

(a) $_nX^{m-4}$ (b) $_{n-2}Y^{m-4}$ (c) $_{n-4}Z^{m-4}$ (d) $_{n-1}Z^{m-4}$

136. In radioactive element, β–rays emits from **[AIEEE 2002]**

(a) Nucleus (b) Outer-orbit (c) Inner-orbit (d) None of these

137. The equation $_zX^A \rightarrow {}_{z+1}Y^A + {}_{-1}e^0 + \bar{\nu}$ is **[CPMT 2002]**

(a) β-emission (b) α-emission (c) e^- capture (d) Fission

138. A π^0 at rest decays into 2γ rays $\pi^0 \rightarrow \gamma + \gamma$. Then which of the following can happen **[CPMT 2002]**

(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

139. A radioactive substance emits

(a) Electromagnetic radiation
(b) Electrons revolving around the nucleus
(c) Charged particles
(d) Neutral particles

140. Which of the following processes represents a gamma-decay

(a) $^AX_z + \gamma \rightarrow {}^AX_{z-1} + a + b$ (b) $^AX_Z + {}^1n_0 \rightarrow {}^{A-3}X_{Z-2} + c$ (c) $^AX_Z \rightarrow {}^AX_Z + f$ (d) $^AX_Z + e_{-1} \rightarrow {}^AX_{Z-1} + g$

141. The S.I. unit of radioactivity is

(a) Roentgen (b) Rutherford (c) Curie (d) Becqueral

142. Which one of the following statements about uranium is correct

(a) ^{235}U is fissionable by thermal neutrons

(b) Fast neutrons trigger the fission process in ^{235}U

(c) ^{238}U breaks up into fragments when bombarded by slow neutrons

(d) ^{235}U is an unstable isotope and undergoes spontaneous fission

143. When a radioactive substance emits an α-particle, its position in the periodic table is lowered by

(a) One place (b) Two places (c) Three places (d) Four places

144. Which rays contain positively charged particles **[CBSE PM/PD 2001]**

(a) α-rays (b) β-rays (c) γ-rays (d) x-rays

145. The electron emitted in beta radiation originates from

[Similar to (IIT-JEE 1983; ISM Dhanbad 1994; RPET 1994; AFMC 1997; BHU 2000); IIT-JEE (Screening) 2001]

(a) Inner orbits of atoms (b) Free electrons existing in nuclei

(c) Decay of a neutron in nucleus (d) Photon escaping from the nucleus.

146. Which of the following is a good nuclear fuel **[Manipal MEE 1995; RPET 2001]**

(a) Neptunium – 239 (b) Plutonium – 239 (c) Thorium – 236 (d) Uranium – 236

147. In which of the following decay, the element does not change

(a) β-decay (b) α-decay (c) γ-decay (d) None of these

148. The correct order of ionizing capacity of α, β and γ–rays is

(a) $\alpha > \gamma > \beta$ (b) $\alpha > \beta > \gamma$ (c) $\alpha < \beta < \gamma$ (d) $\alpha > \beta < \gamma$

149. A neutron with velocity V strikes a stationary deuterium atom., its kinetic energy changes by a factor of

(a) $\frac{15}{16}$ (b) $\frac{1}{2}$ (c) $\frac{2}{1}$ (d) None of these

150. A nucleus $_ZX^A$ emits an α-particle. The resultant nucleus emits a β^+ particle. The respective atomic and mass numbers of the final nucleus will be

(a) Z-3, A-4 (b) Z-1, A-4 (c) Z-2, A-4 (d) Z, A-2

151. The same radioactive nucleus may emit **[BHU Med. 1999]**

(a) All the three α, β and γ simultaneously (b) All the three α, β and γ one after another

(c) Either α or β and γ at a time (d) Only α and β simultaneously

152. Consider the following two statements **[AMU (Med.) 1999]**

(A) Energy spectrum of α-particles emitted in radioactive decay is discrete.

(B) Energy spectrum of β-particles emitted in radioactive decay is continuous

(a) Only A is correct (b) Only B is correct (c) A is correct but B is wrong (d)Both A and B are correct

153. Among electron, proton, neutron and α particle the maximum penetration capacity is for **[EAMCET (Engg.) 1998]**

(a) Electron (b) Proton (c) Neutron (d) α-particle

154. When $_{15}P^{30}$ decays to become $_{14}Si^{30}$, the particle released is

(a) Electron (b) α-particle (c) Neutron (d) Positron

155. Which of the following does not have the velocity equal to that of light

(a) Radio waves (b) γ–rays (c) β-particles (d) EM waves

156. Masses of two isobars $_{29}Cu^{64}$ and $_{30}Zn^{64}$ are 63.9298 amu and 63.9292 amu respectively. It can be concluded that from these data that

(a) Both the isobars are stable (b) Zn^{64} is radioactive decaying to Cu^{64} through β-decay

(c) Cu^{64} is radioactive, decaying to Zn^{64} through γ-decay (d) Cu^{64} is radioactive decaying to Zn^{64} through β-decay

157. α-particles of energy 400 KeV are bombarded on nucleus of $_{82}Pb$. In scattering of α-particles, its minimum distance from nucleus will be

(a) 0.59 nm (b) 0.59 $\mathring{A}$ (c) 5.9 pm (d) 0.59 pm

158. In the given nuclear reaction *A*, *B*, *C*, *D*, *E* represents ${}_{92}U^{238} \xrightarrow{\alpha} {}_{B}Th^{A} \xrightarrow{\beta} {}_{D}Pa^{C} \xrightarrow{E} {}_{92}U^{234}$

(a) $A = 234, B = 90, C = 234, D = 91, E = \beta$ (b) $A = 234, B = 90, C = 238, D = 94, E = \alpha$

(c) $A = 238, B = 93, C = 234, D = 91, E = \beta$ (d) $A = 234, B = 90, C = 234, D = 93, E = \alpha$

159. The activity of a radioactive sample is measured as 9750 counts per minute at $t = 0$, as 975 counts per minute at $t = 5$ min. the decay constant is approximatel

(a) 0.230 per minute (b) 0.461 per minute (c) 0.691 per minute (d) 0.922 per minute

160. Which of the following isotopes is used for the treatment of cancer

(a) K^{40} (b) Co^{60} (c) Sr^{90} (d) I^{131}

161. Age of a tree is determined using radio-isotope of **[EAMCET (Engg.) 1995]**

(a) Carbon (b) Cobalt (c) Iodine (d) Phosphorus

162. Which of the following statements are true regarding radioactivity

(I) All radioactive elements decay exponentially with time

(II) Half life time of a radioactive element is time required for one half of the radioactive atoms to disintegrate

(III) Age of earth can be determined with the help of radioactive dating

(IV) Half life time of a radioactive element is 50% of its average life period

Select correct answer using the codes given below

Codes : **[SCRA 1994]**

(a) I and II (b) I, III and IV (c) I, II and III (d) II and III

163. Unit of radioactivity is *Rutherford*. Its value is **[MP PMT 1994]**

(a) 3.7×10^{10} *disintegrations/sec* (b) 3.7×10^{6} *disintegrations/sec*

(c) 1.0×10^{10} *disintegrations/sec* (d) 1.0×10^{6} *disintegrations/sec*

164. The essential distinction between X-rays and γ-rays is that

(a) γ-rays have smaller wavelength than X-rays

(b) γ-rays emanate from nucleus while X-rays emanate from outer part of the atom

(c) γ-rays have greater ionizing power than X-rays

(d) γ-rays are more penetrating than X-rays

165. Neutrons can be accelerated by

(a) Cyclotron (b) Betatron (c) Van-de-graph generator (d) None of these

166. If the end *A* of a wire is irradiated with α-rays and the other end *B* is irradiated with β-rays, then

(a) A current will flow from *A* to *B*

(b) A current will flow from *B* to *A*

(c) There will be no current in the wire

(d) A current will flow from each end to the mid-point of the wire

167. Which of the following statements is true **[MP PET 1993]**

(a) ${}_{78}Pt^{192}$ has 78 neutrons (b) ${}_{84}Po^{214} \rightarrow {}_{82}Pb^{210} + \beta^-$ (c) ${}_{92}U^{238} \rightarrow {}_{90}Th^{234} + {}_{2}He^{4}$ (d) ${}_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + {}_{2}He^{4}$

168. When a radioactive substance is subjected to a vacuum, the rate of disintegration per second

(a) Increases considerably (b) Increases only if the products are gaseous

(c) Is not affected (d) Suffers a slight decrease

169. Radioactivity is due to **[MP PMT 1983]**

(a) Unstable electronic configuration (b) Stable electronic configuration

(c) Stable nucleus (d) Unstable nucleus

170. Cosmic rays, as they arrive at the top of the atmosphere, consist mainly of **[NCERT 1979]**

(a) High energy electrons (b) Heavy atoms (c) Heavy nuclei (d) Protons

171. After 280 days, the activity of a radioactive sample is 6000 *dps*. The activity reduces to 3000 *dps* after another 140 days. The initial activity of the sample in *dps* is

(a) 6000 (b) 9000 (c) 3000 (d) 24000

172. The half-life of radium is 1600 years. What is the fraction of sample undecayed after 6400 years

(a) $\frac{1}{4}$ (b) $\frac{1}{8}$ (c) $\frac{1}{16}$ (d) $\frac{1}{24}$

173. A count rate meter shows a count of 240 per minute from a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half-life of the source is

(a) 20 *min* (b) 30 *min* (c) 80 *min* (d) 120 *min*

174. The half life of a sample of a radioactive substance is 1 hour. If 8×10^{10} atoms are present at t = 0, then the number of atoms decayed in the duration t = 2 hour to t = 4 hour will be

(a) 2×10^{10} (b) 1.5×10^{10} (c) Zero (d) Infinity

175. The half-life of radium is about 1600 years. Of 100 *g* of radium existing now, 25 *g* will remain unchanged after **[CBSE PMT/PDT (Screening) 2004]**

(a) 3200 *years* (b) 4800 *years* (c) 6400 *years* (d) 2400 *years*

176. A radioactive substance decays to 1/16th of its initial activity in 40 days. The half-life of the radioactive substance expressed in days is **[AIIMS 2003]**

(a) 2.5 (b) 5 (c) 10 (d) 20

177. Rate of decay is proportional to

(a) The number of nuclei initially present (b) The number of active nuclei present at that instant

(c) To the number of decayed nuclei (d) None of these

178. The rate of radioactive decay of a material is 800 *dps*. If the half-life period of the material is 1 *sec*, the rate of decay after 3 seconds will be

(a) 800 *dps* (b) 400 *dps* (c) 200 *dps* (d) 100 *dps*

179. A sample of radioactive element has a mass of 10 *g* at an instant t = 0. The approximate mass of this element in the sample after two mean lives is

(a) 1.35 *g* (b) 2.50 *g* (c) 3.70 *g* (d) 6.30 *g*

180. The half-life of radium is 1620 years and its atomic weight is 226 *kg* per *kilomol*. The number of atoms that will decay from its 1 *gm* sample per second will be (Avogadro's number $N = 6.02 \times 10^{26}$ *atom/kilomol*)

(a) 31.1×10^{15} (b) 3.11×10^{15} (c) 3.6×10^{12} (d) 3.61×10^{10}

181. Half-life of a radioactive substance is 20 minutes. The time between 20% and 80% decay will be

(a) 20 minutes (b) 40 minutes (c) 30 minutes (d) 25 minutes

182. The half-life of a radioactive substance is 48 hours. How much time will it take to disintegrate to its $\frac{1}{16}$ *th* part **[BCECE**

(a) 12 *h* (b) 16 *h* (c) 48 *h* (d) 192 *h*

183. A radioactive material has an initial amount of 16 *gm*. After 120 days it reduces to 1 *gm*, then the half-life of radioactive material is

[Similar to (RPET 1997; MP PET/PMT 2002); Bihar MEE 1995; Manipal MEE 1995;

EAMCET 1994; MP PMT 1997; AFMC 2000; DPMT 2002; CPMT 2003]

(a) 60 days (b) 30 days (c) 40 days (d) 240 days

184. *A* and *B* are two radioactive substances whose half lives are 1 and 2 years respectively. Initially 10 *gm* of *A* and 1 *gm* of *B* is taken. The time (approximate) after which they will have same quantity remaining is

(a) 6.62 years (b) 5 years (c) 3.2 years (d) 7 years

185. The activity of a sample is $64 \times 10^{-5}\ Ci$. Its half-life is 3 days. The activity will become $5 \times 10^{-6}\ Ci$ after

(a) 12 days (b) 7 days (c) 18 days (d) 21 days

186. The half life period of a radioactive element *X* is same as the mean life time of another radioactive element *Y*. initially both of them have the same number of atoms. Then

(a) *X* and *Y* have the same decay rate initially (b) *X* and *Y* decay at the same rate always

(c) *Y* will decay at a faster rate than *X* (d) *X* will decay at a faster rate than *Y*

187. *N* atoms of a radioactive element emit *n* alpha particles per second. The half life of the element is

[MP PET 1995; MP PMT 1997, 2003]

(a) $\frac{n}{N}\ sec$ (b) $\frac{N}{n}\ sec$ (c) $\frac{0.693\ N}{n}\ sec$ (d) $\frac{0.693\ n}{N}\ sec$

188. A radioactive sample at any instant has its disintegration rate 5000 disintegration per minute. After 5 minutes, the rate is 1250 disintegrations per minute. Then, the decay constant (per minute) is

(a) 0.8 ln 2 (b) 0.4 ln 2 (c) 0.2 ln 2 (d) 0.1 ln 2

189. A radioactive substance has an average life of 5 hours. In a time of 5 hours [Orissa JEE 2003]

(a) Half of the active nuclei decay (b) Less than half of the active nuclei decay

(c) More than half of the active nuclei decay (d) All active nuclei decay

190. In a mean life of a radioactive sample [MP PMT 2000, 2003]

(a) About 1/3 of substance disintegrates (b) About 2/3 of the substance disintegrates

(c) About 90% of the substance disintegrates (d) Almost all the substance disintegrates

191. Half-life of a substance is 10 years. In what time, it becomes $\frac{1}{4}$th part of the initial amount

(a) 5 years (b) 10 years (c) 20 years (d) None of these

192. If in a radioactive substance, the initial number of active atoms is 1000, the number of active atoms after three half lives will be

[RPMT 2002]

(a) 1000 (b) 500 (c) 250 (d) 125

193. A sample of a radioactive substance contains 2828 atoms. If its half-life is 2 days, how many atoms will be left intact in the sample after one day

(a) 1414 (b) 1000 (c) 2000 (d) 707

194. The activity of a sample of a radioactive material is *A* at time t_1 and A_2 at time t_2 $(t_2 > t_1)$. If its mean life *T*, then (QBP-1263)

[BHU 2002]

(a) $A_1 t_1 = A_2 t_2$ (b) $A_1 - A_2 = t_2 - t_1$ (c) $A_2 = A_1 e^{(t_1 - t_2)/T}$ (d) $A_2 = A_1 e^{(t_1 / t_2)T}$

195. If N_0 is the original mass of the substance of half life period $T_{1/2} = 5$ years, then the amount of substance left after 15 years is

[AIEEE 2002]

(a) $N_0 / 8$ (b) $N_0 / 16$ (c) $N_0 / 2$ (d) $N_0 / 4$

196. In a sample of radioactive material, what percentage of the initial number of active nuclei will decay during one mean life

[KCET 2002]

(a) 69.3% (b) 63% (c) 50% (d) 37%

197. The half-life of a radioactive substance against α-decay is 1.2×10^{7} *s*. What is the decay rate for 4.0×10^{15} atoms of the substance

[AMU (Med.) 2002]

(a) 4.6×10^{12} *atoms/s* (b) 2.3×10^{11} *atoms/s* (c) 4.6×10^{10} *atoms/s* (d) 2.3×10^{8} *atoms/s*

198. 10 *gm* of radioactive material of half-life 15 year is kept in store for 20 years. The disintegrated material is

(a) 12.5 *g* (b) 10.5 *g* (c) 6.03 *g* (d) 4.03 *g*

199. If half-life of a substance is 3.8 days and its quantity is 10.38 *gm*. Then substance quantity remaining left after 19 days will be

[(Similar to UPSEAT 2001; RPMT 2000; AFMC 2002]

(a) 0.151 *gm* (b) 0.32 *gm* (c) 1.51 *gm* (d) 0.16 *gm*

200. Decay constant of radium is λ. By a suitable process its compound radium bromide is obtained. The decay constant of radium bromide will be

(a) λ (b) More than λ (c) Less than λ (d) Zero

201. A radioactive material decays by simultaneous emission of two particles with respective half lives 1620 and 810 *years*. The time (in *years*) after which one-fourth of the material remains is

(a) 1080 (b) 2430 (c) 3240 (d) 4860

202. If the decay or disintegration constant of a radioactive substance is λ, then its half life and mean life are respectively ($\log_e 2$ can also be written as log 2)

(a) $\frac{1}{\lambda}$ and $\frac{\log_e 2}{\lambda}$ (b) $\frac{\log_e 2}{\lambda}$ and $\frac{1}{\lambda}$ (c) $\lambda \log_e 2$ and $\frac{1}{\lambda}$ (d) $\frac{\lambda}{\log_e 2}$ and $\frac{1}{\lambda}$

203. The decay constant of a radioactive element is 0.01 *per sec*. Its half life period is **[DPMT 2001]**

(a) 693 *sec* (b) 6.93 *sec* (c) 0.693 *sec* (d) 69.3 *sec*

204. 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

205. 99% of a radioactive element will decay between **[AMU (Engg.) 2001]**

(a) 6 and 7 half lives (b) 7 and 8 half lives (c) 8 and 9 half lives (d) 9 half lives

206. Certain radioactive substance reduces to 25% of its value in 16 days. Its half-life is **[MP PMT 2001]**

(a) 32 days (b) 8 days (c) 64 days (d) 28 days

207. 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}

208. 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*

209. During mean life of a radioactive element, the fraction that disintegrates is **[CPMT 2001]**

(a) e (b) $\frac{1}{e}$ (c) $\frac{e-1}{e}$ (d) $\frac{e}{e-1}$

210. Half-life is measured by **[RPET 2001]**

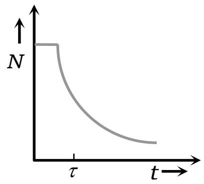
(a) Geiger-Muller counter (b) Carbon dating (c) Spectroscopic method (d) Wilson-Cloud chamber

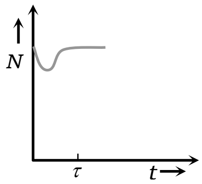
211. 1 *Curie* is equal to **[BHU 2001]**

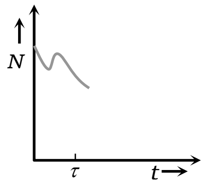
(a) 3×10^{10} *disintegrations / sec* (b) 3.7×10^{7} *disintegrations / sec*

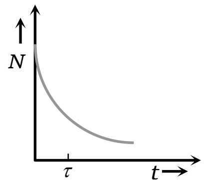
(c) 5×10^{7} *disintegrations / sec* (d) 3.7×10^{10} *disintegrations / sec*

212. A radioactive sample consists of two distinct species having equal number of atoms initially. The mean life time of one species is τ and that of the other is 5τ. The decay products in both cases are stable. A plot is made of the total number of radioactive nuclei as a function of time. Which of the following figures best represents the form of this plot. **[IIT-JEE (Screening) 2001]**

(a) 

(b) 

(c) 

(d) 

213. A radioactive substance has half-life of 60 minutes. During 3 hours, the fraction of atoms that have decayed would be

[BHU (Med.) 2000]

(a) 12.5% (b) 87.5% (c) 8.5% (d) 25.1%

214. The activity of a radioactive sample is 1.6 *curie*, and its half-life is 2.5 days. Its activity after 10 days will be

(a) 0.8 *curie* (b) 0.4 *curie* (c) 0.1 *curie* (d) 0.16 *curie*

215. The half-life of ${}^{42}_{19}K$ is 12.5 hours. If the original sample of it contained 256 *gm*., the amount of ${}^{42}_{19}K$ after 100 hours will be

[UPSEAT 2000]

(a) 1.00 *gm* (b) 2.00 *gm* (c) 2.56 *gm* (d) 5.12 *gm*

216. N_0 is the number of radioactive atoms at any instant and N is the number of the radioactive atoms remaining undecayed after time *t*. The graph drawn with $\log_e N$, where *e* is the base of natural logarithm along *y*-axis and *t* along the *X*-axis will be a straight line with slope

(a) λ (b) $-\lambda$ (c) $\frac{1}{\lambda}$ (d) $-\frac{1}{\lambda}$

217. 1 *mg* of radioactive substance has 2.68×10^{18} nuclei. Its half-life is 1620 year. After 3240 years how many nuclei would have disintegrated **[J & K CET 2000]**

(a) 1.82×10^{18} (b) 1.34×10^{18} (c) 0.67×10^{18} (d) 2.01×10^{18}

218. What fraction of radioactive material will get disintegrated in a period of two half-lives

(a) Whole (b) Half (c) One-fourth (d) Three-fourth

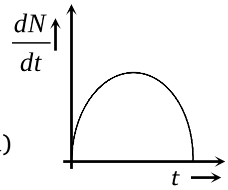
219. Half lives of two radioactive substances *A* and *B* are respectively 20 minutes and 40 minutes. Initially the sample of *A* and *B* have equal number of nuclei. After 80 minutes, the ratio of remaining number of *A* and *B* nuclei is **[CBSE 1998; JIPMER 2000]**

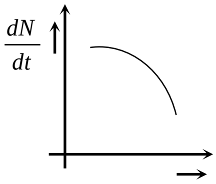
(a) 1 : 16 (b) 4 : 1 (c) 1 : 4 (d) 1 : 1

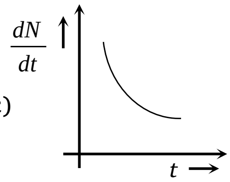
220. A radioactive sample has half-life of 5 years. Probability of decay in 10 years will be **[RPET 2000]**

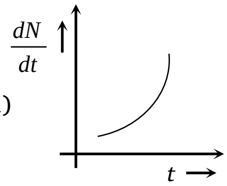
(a) 100% (b) 75% (c) 50% (d) 25%

221. Radioactive element decays to form a stable nuclide, then the rate of decay of reactant $\left(\frac{dN}{dt}\right)$ will vary with time (t) as shown in figure **[DCE 2000]**

(a) 

(b) 

(c) 

(d) 

222. 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

223. 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

224. Half life of radioactive element depends upon **[NCERT 1978; AFMC 1996]**

(a) Amount of element present (b) Temperature (c) Pressure (d)

225. What percentage of original radioactive atoms is left after five half lives

(a) 0.3% (b) 1% (c) 31% (d) 3.125%

226. A sample contains 16 *gm* of a radioactive material, the half life of which is two days. After 32 days, the amount of radioactive material left in the sample is

(a) Less than 1 *mg* (b) $\frac{1}{4}$ *gm* (c) $\frac{1}{2}$ *gm* (d) 1 *gm*

227. The count rate of Geiger-Muller counter for the radiation of a radioactive material of half life of 30 *minutes* decreases to 5 s^{-1} after 2 hours. The initial-count rate was

(a) $25\ s^{-1}$ (b) $80\ s^{-1}$ (c) $625\ s^{-1}$ (d) $20\ s^{-1}$

228. Carbon-14 decays with half-life of about 5,800 years. In a sample of bone, the ratio of carbon-14 to carbon-12 is found to be $\frac{1}{4}$ of what it is in free air. This bone may belong to a period about x centuries ago, where x is nearest to **[KCET 1994]**

(a) 2 × 58 (b) 58 (c) 58/2 (d) 3 × 58

229. The decay constant for radioactive isotope Co^{57} is $3\times10^{-8}\ \text{sec}^{-1}$. The number of disintegration taking place in a milligram of Co^{57} per second is

(a) 10^{11} (b) 3×10^{6} (c) 3×10^{11} (d) 3×10^{7}

230. The half life of a radioactive material is T. After T/2 time, the material has been disintegrated is

(a) 1/2 (b) 3/4 (c) $\frac{1}{\sqrt{2}}$ (d) $(\sqrt{2}-1)/\sqrt{2}$

231. The decay constant λ of the radioactive sample is the probability of decay of an atom in unit time, then

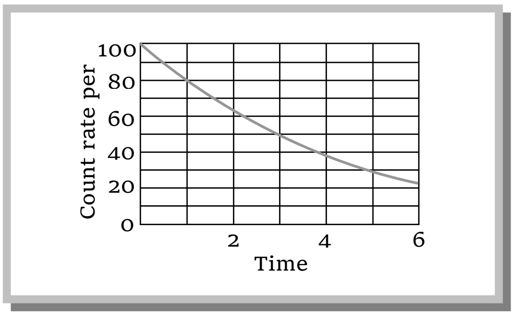
(a) λ decreases as atoms become older
(b) λ increases as the age of atoms increases
(c) λ is independent of the age

(d) Behaviour of λ with time depends on the nature of the activity

232. If 10% of a radioactive material decays in 5 days, then the amount of original material left after 20 days is approximately **[MNR 1987]**

(a) 60% (b) 65% (c) 70% (d) 75%

233. The count rate of 10*g* of radioactive material was measured at different times and this has been shown in the figure. The half life of material and the total counts (approximately) in the first half life period, respectively are **[CPMT 1986]**



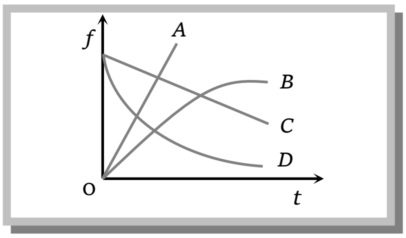
(a) 4*h*, 9000

(b) 3*h*, 14000

(c) 3*h*, 235

(d) 3*h*, 50

234. The fraction *f* of radioactive material that has decayed in time *t*, varies with time *t*. The correct variation is given by the curve



(a) *A*

(b) *B*

(c) *C*

(d) *D*

235. The count rate from $100\ cm^3$ of a radioactive liquid is c. Some of this liquid is now discarded. The count rate of the remaining liquid is found to be c/10 after three half-lives. The volume of the remaining liquid, in cm^3, is

(a) 20 (b) 40 (c) 60 (d) 80

236. A radioactive isotope X with a half-life of 137×10^9 years decays to *Y* which is stable. A sample of rock from the moon was found to contain both the elements *X* and *Y* which were in the ratio of 1 : 7. The age of the rock is

(a) 1.96×10^8 years (b) 3.85×10^9 years (c) 4.11×10^9 years (d) 9.59×10^9 years

237. A radioactive element emits 200 particles per second. After three hours 25 particles per second are emitted. The half life period of element will be

(a) 50 minutes (b) 60 minutes (c) 70 minutes (d) 80 minutes

238. Element *X* decays into element *Y* with a half-life of 3 days. On 1st March a piece of *X* has a mass of 10 *g*. What mass of *X* and of *Y* exist 6 days after

	Mass of *X*	Mass of *Y*
(a)	5 *g*	5 *g*
(b)	10 *g*	Zero
(c)	2.5 *g*	7.5 *g*
(d)	7.5 *g*	2.5 *g*

239. The radioactivity of a sample is R_1 at a time T_1 and R_2 at a time T_2. If the half life of the specimen is *T*, the number of atoms that have disintegrated in the time $(T_2 - T_1)$ is proportional to

(a) $(R_1T_1 - R_2T_2)$ (b) $(R_1 - R_2)$ (c) $(R_1 - R_2)/T$ (d) $(R_1 - R_2)T$

240. It is found that the C^{14} activity in a wooden article is one fourth of that found in a newly cut wood. If the half life of C^{14} is 5600 years, then the age of the wooden article is

(a) 5600 *y* (b) 11200 *y* (c) 16800 *y* (d) 22400 *y*

241. A radioactive material has a mean lives of 1620 year and 520 year for α and β emission respectively. The material decays by simultaneous α and β emission. The time is which 1/4th of the material remains intact is

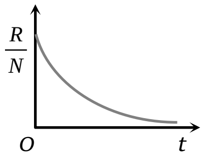
(a) 4675 *year* (b) 720 *year* (c) 648 *year* (d) 324 *year*

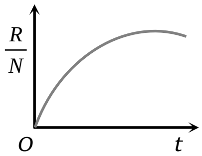
242. Two radioactive elements *X* and *Y* have half-life times of 50 minutes and 100 minutes, respectively. Samples *X* and *Y* initially contain equal numbers of atoms. After 200 minutes, the ratio

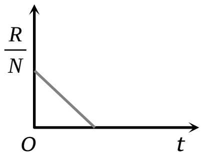
$$\frac{\text{Number of undecayed atoms of } X}{\text{Number of undecayed atoms of } Y} \text{ is}$$

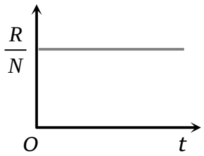
(a) 4 (b) 2 (c) 1/2 (d) 1/4

243. A radioactive sample has N_0 active atoms at $t = 0$. If the rate of disintegration at any time is *R* and the number of atoms is *N*, then the ratio *R*/*N* varies with time as

(a)


(b)


(c)


(d)


244. The specific activity of Cobalt-57, whose half life is 270 days, will be

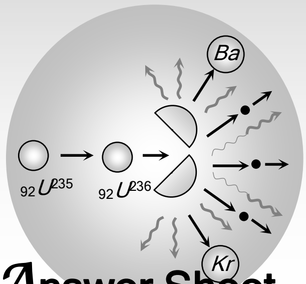
(a) 8478 *Curie*/*gm* (b) 847.8 *Curie*/*gm* (c) 84.78 *Curie*/*gm* (d) 1 *Curie*/*gm*

245. The mass of radon-222 corresponding to 1 *Curie* will be, if its half life is 3.8 days

(a) 6.46×10^{-8} *gm* (b) 64.60×10^{-7} *gm* (c) 6.46×10^{-10} *gm* (d) 64.60×10^{-10} *gm*

246. In the study of a radioactive element *N* number of β-particles are emitted during the time *t* = 0 to *t* = 1*s* and 1.37*N* number of β-particles during time *t* = 0 to *t* = 2*s*. The mean life of the element is

(a) 1*s* (b) 0.7*s* (c) 1.4*s* (d) 2.0*s*



Answer Sheet

Assignments

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
c	a	a	c	a	d	d	c	d	d	d	d	b	a	c	b	b	a	b	c
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
b	c	d	a	c	c	a	c	b	b	c	c	d	d	b	b	d	c	c	d
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
b	c	a	a	a	c	d	a	d	c	c	b	c	a	a	a	a	c	b	a
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
b	d	a	b	d	b	d	b	c	b	d	a	d	b	c	a	a	b	c	c
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
d	d	c	c	a	c	d	b	c	d	c	d	a	a	a	b	a	a	a	b
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
d	c	c	a	a,d	b	d	d	b	a	a	d	b	b	b	a	a	a	a	d
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
a	d	c	b	b	b	b	c	c	b	a	d	b	b	d	a	a	b	a,c	c
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
d	a	b	a	c	b	c	b	d	a	c	b	c	d	c	d	d	a	b	b
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
a	c	d	b	d	a	c	c	d	d	d	c	a	b	a	c	b	d	a	d
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
b	d	b	a	d	c	c	b	c	b	c	d	c	c	a	b	d	c	b	a
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
a	b	d	c	a	b	c	c	c	a	d	d	b	c	a	b	d	d	c	b
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
c	b	d	d	d	a	b	a	c	d	c	b	b	b	d	c	b	c	d	b
241	242	243	244	245	246														
c	d	d	a	c	a														