EXERCISE-I

Nucleus, Nuclear Reaction

1. The binding energy of deuteron $_1^2H$ is 1.112 MeV per nucleon and an $\alpha-$particle $_2^4He$ has a binding energy of 7.047 MeV per nucleon. Then in the fusion reaction $_1^2H+_1^2H\rightarrow_2^4He+Q$, the energy Q released is

(A) 1 MeV (B) 11.9 MeV
(C) 23.8 MeV (D) 931 MeV

2. Binding energy of a nucleus is

(A) Energy given to its nucleus during its formation
(B) Total mass of nucleus converted to energy units
(C) Loss of energy from the nucleus during its formation
(D) Total K.E. and P.E. of the nucleons in the nucleus

3. One requires energy E_n to remove a nucleon from a nucleus and an energy 'E_e' to remove an electron from the orbit of an atom. Then

(A) $E_n = E_e$ (B) $E_n < E_e$
(C) $E_n > E_e$ (D) $E_n \geq E_e$

4. Which of the following pairs is an isobar

(A) $_1H^1$ and $_1H^2$ (B) $_1H^2$ and $_1H^3$
(C) $_6C^{12}$ and $_6C^{13}$ (D) $_{15}P^{30}$ and $_{14}Si^{30}$

5. Equivalent energy of mass equal to 1 *a.m.u.* is

(A) 931 KeV (B) 931 eV
(C) 931 MeV (D) 9.31 MeV

6. The binding energies per nucleon for a deuteron and an $\alpha-$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) $2(x_2-x_1)$

7. The mass number of a nucleus is equal to the number of

(A) Electrons it contains
(B) Protons it contains
(C) Neutrons it contains
(D) Nucleons it contains

8. The rest energy of an electron is

(A) 510 KeV (B) 931 KeV
(C) 510 MeV (D) 931 MeV

9. 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

10. Outside a nucleus

(A) Neutron is stable
(B) Proton and neutron both are stable
(C) Neutron is unstable
(D) Neither neutron nor proton is stable

11. 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) $1:3^{1/2}$

12. Energy of 1g uranium is equal to

(A) $9.0\times10^{13}J$ (B) $9.0\times10^{19}J$
(C) $3.0\times10^{16}J$ (D) $3.0\times10^{17}J$

13. In a fission reaction $_{92}^{236}U\rightarrow^{117}X+^{117}Y+n+n$, the binding energy per nucleon of X and Y is 8.5 MeV whereas of ^{236}U is 7.6 MeV. The total energy liberated will be about

(A) 200 KeV (B) 2 MeV
(C) 200 MeV (D) 2000 MeV

14. Atomic number of a nucleus is Z and atomic mass is M. The number of neutron is

(A) $M-Z$ (B) M
(C) Z (D) $M+Z$

15. The α-particle is the nucleus of an atom of
(A) Neon (B) Hydrogen
(C) Helium (D) Deuterium

16. The force acting between proton and proton inside the nucleus is
(A) Coulombic (B) Nuclear
(C) Both (D) None of these

17. For a nucleus to be stable, the correct relation between neutron number N and Proton number Z is
(A) $N > Z$ (B) $N = Z$
(C) $N < Z$ (D) $N \geq Z$

18. Two nucleons are at a separation of $1 \times 10^{-15} m$. The net force between them is F_1, if both are neutrons, F_2 if both are protons and F_3 if one is a proton and other is a neutron. In such a case
(A) $F_2 > F_1 > F_3$ (B) $F_1 = F_2 = F_3$
(C) $F_1 = F_2 > F_3$ (D) $F_1 = F_3 > F_2$

19. 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) $M = N[M_n + M_P]$

20. If a H_2 nucleus is completely converted into energy, the energy produced will be around
(A) 1 MeV (B) 938 MeV
(C) 9.38 MeV (D) 238 MeV

21. Energy generation in stars is mainly due to
(A) Chemical reactions
(B) Fission of heavy nuclei
(C) Fusion of light nuclei
(D) Fusion of heavy nuclei

22. Which of the following is the fusion reaction
(A) ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^4$
(B) ${}_0n^1 + {}_7N^{14} \rightarrow {}_6C^{14} + {}_1H^1$
(C) ${}_0n^1 + {}_{92}U^{238} \rightarrow {}_{93}Np^{239} + \beta^{-1} + \gamma$
(D) ${}_1H^3 \rightarrow {}_2He^3 + \beta^{-1} + \gamma$

23. 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
(A) 2/3 (B) 4/9
(C) 3/4 (D) 5/9

24. Fusion reaction is initiated with the help of
(A) Low temperature (B) High temperature
(C) Neutrons (D) Any particle

25. When a ${}_4Be^9$ atom is bombarded with $\alpha-$particles, one of the product of nuclear transmutation is ${}_6C^{12}$. The other is
(A) ${}_{-1}e^0$ (B) $X-$
(C) ${}_1D^2$ (D) ${}_0n^1$

26. Atom bomb consists of two pieces of ${}_{92}U^{235}$ and a source of
(A) Proton (B) Neutron
(C) Meson (D) Electron

27. Most suitable element for nuclear fission is the element with atomic number near
(A) 11 (B) 21
(C) 52 (D) 92

28. During the nuclear fusion reaction
(A) A heavy nucleus breaks into two fragments by itself
(B) A light nucleus bombarded by thermal neutrons breaks up
(C) A heavy nucleus bombarded by thermal neutrons breaks up
(D) Two light nuclei combine to give a heavier nucleus and possibly other products

29. In a working nuclear reactor, Cadmium rods, (control rods) are used to
(A) Speed up neutrons
(B) Slow down neutrons
(C) Absorb some neutrons
(D) Absorb all neutrons

30. Fusion reaction takes place at high temperature because
(A) Atoms are ionised 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

31. 200 MeV of energy may be obtained per fission of U^{235}. A reactor is generating 1000 kW of power. The rate of nuclear fission in the reactor is

(A) 1000 (B) 2×10^8

(C) 3.125×10^{16} (D) 931

32. In the nuclear reaction $_{92}U^{238} \rightarrow _z Th^A +_2 He^4$, the values of A and Z are

(A) $A = 234, Z = 94$ (B) $A = 234, Z = 90$

(C) $A = 238, Z = 94$ (D) $A = 238, Z = 90$

33. 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 $1\,eV = 1.6\times10^{-19}\,J$)

(A) 3.125×10^{13} (B) 3.125×10^{14}

(C) 3.125×10^{15} (D) 3.125×10^{16}

34. A chain reaction is continuous due to

(A) Large mass defect

(B) Large energy

(C) Production of more neutrons in fission

(D) None of these

35. Complete the equation for the following fission process $_{92}U^{235} +_0 n^1 \rightarrow _{38} Sr^{90} + ...$

(A) $_{54}Xe^{143} + 3\,_0n^1$ (B) $_{54}Xe^{145}$

(C) $_{57}Xe^{142}$ (D) $_{54}Xe^{142} +_0 n$

36. The example of nuclear fusion is

(A) Formation of barium and krypton from uranium

(B) Formation of helium from hydrogen

(C) Formation of plutonium 235 from uranium 235

(D) Formation of water from hydrogen and oxygen

37. In nuclear fission, the fission reactions proceeds with a projectile. Which of the following suits the best

(A) Slow proton (B) Fast neutron

(C) Slow neutron (D) None of these

38. When two deuterium nuclei fuse together to form a tritium nuclei, we get a

(A) Neutron (B) Deutron

(C) $\alpha-$particle (D) Proton

39. Name of the India's first nuclear reactor is

(A) RAMBHA (B) MENAKA

(C) URVASI (D) APSARA

40. 1 g of hydrogen is converted into 0.993 g of helium in a thermonuclear reaction. The energy released is

(A) $63\times10^{7}\,J$ (B) $63\times10^{10}\,J$

(C) $63\times10^{14}\,J$ (D) $63\times10^{20}\,J$

41. When a slow neutron goes sufficiently close to a U^{235} nucleus, then the process that takes place is

(A) Fission of U^{235} (B) Fusion of neutron

(C) Fusion of U^{235} (D) First (A) then(B)

42. If a proton and anti-proton come close to each other and annihilate, how much energy will be released

(A) $1.5\times10^{-10}\,J$ (B) $3\times10^{-10}\,J$

(C) $4.5\times10^{-10}\,J$ (D) None of these

43. Which of these is a fusion reaction

(A) $^1_3H +^1_2 H =^2_4He +^0_1n$

(B) $^{238}_{92}U \rightarrow ^{206}_{82}Pb + 8(^4_2He) + 6(^0_{-1}\beta)$

(C) $^{12}_7C \rightarrow ^{12}_6C + \beta^+ + \gamma$

(D) None of these

44. In a nuclear fission reaction

(A) Two light nuclei combine to produce a heavier nucleus

(B) A light nucleus bombarded by thermal neutrons breaks up

(C) A heavy nucleus bombarded by thermal neutrons breaks up

(D) A heavy nucleus breaks up by itself

45. Hydrogen bomb is based on which of the following phenomenon

(A) Nuclear fission (B) Nuclear fusion

(C) Radioactive decay (D) None of these

46. The number of neutrons released when $_{92}U^{235}$ undergoes fission by absorbing $_0n^1$ and $(_{56}Ba^{144} +_{36} Kr^{89})$ are formed, is

(A) 0 (B) 1

(C) 2 (D) 3

47. Energy released in fusion of 1 *kg* of deuterium nuclei

(A) $8\times10^{13}\ J$ (B) $6\times10^{27}\ J$

(C) $2\times10^{7}\ KwH$ (D) $8\times10^{23}\ MeV$

48. Best neutron moderator is

(A) Berillium oxide (B) Pure water

(C) Heavy water (D) Graphite

49. Nuclear fission was discovered by

(A) Auto Hahn and F. strassmann

(B) Fermi

(C) Bethe

(D) Rutherford

50. Which of the following is true for a sample of isotope containing U^{235} and U^{238}

(A) Number of neutron are same in both

(B) Number of proton, electron and neutron are same in both

(C) Contain same number of protons and electrons but U^{238} contains 3 more neutrons than U^{235}

(D) U^{238} contains 3 less neutron then U^{235}

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

$_7N^{14} + _2He^4 \rightarrow X + _1H^1$

(A) $_8N^{17}$ (B) $_8O^{17}$

(C) $_7O^{16}$ (D) $_7N^{16}$

52. 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

53. Which of the following are suitable for the fusion process

(A) Heavy nuclei (B) Light nuclei

(C) Atom bomb (D) Radioactive decay

54. 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) $_7N^{14}$

55. A nuclear reaction given by

$_ZX^A \rightarrow _{Z+1}Y^A + _{-1}e^0 + \overline{p}$ represents

(A) γ-decay (B) Fusion

(C) Fission (D) β-decay

56. Work of moderator is

(A) To control the velocity of neutrons

(B) Cooling

(C) As fuel

(D) It is used for safety

57. Light energy emitted by stars is due to

(A) Breaking of nuclei

(B) Joining of nuclei

(C) Burning of nuclei

(D) Reflection of solar light

58. Solar energy is mainly caused due to

(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

59. The binding energy of nucleus is a measure of its

(A) Charge (B) Mass

(C) Momentum (D) Stability

60. Mark the correct statement

(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

61. The nucleus $_{92}U^{234}$ splits exactly in half in a fission reaction in which two neutrons are released. The resultant nuclei are

(A) $_{46}Pd^{116}$ (B) $_{45}Rh^{117}$

(C) $_{45}Rh^{116}$ (D) $_{46}Pd^{117}$

62. A nucleus of $^{210}_{84}Po$ originally at rest emits α particle with speed *v*. What will be the recoil speed of the daughter nucleus

(A) $4v/206$ (B) $4v/214$

(C) $v/206$ (D) $v/214$

63. In a nuclear reactor, the fuel is consumed at the rate of 1 *mg/s*. The power generated in kilowatt is

(A) 9×10^4 (B) 9×10^7

(C) 9×10^8 (D) 9×10^{12}

64. What is used as a moderator in a nuclear reactor

(A) Water (B) Graphite

(C) Cadmium (D) Steel

65. A nucleus is bombarded with a high speed neutron so that resulting nucleus is a radioactive one. This phenomenon is called

(A) Artificial radioactivity

(B) Fusion

(C) Fission

(D) Radioactivity

66. The curve of binding energy per nucleon as a function of atomic mass number has a sharp peak for helium nucleus. This implies that helium

(A) Can easily be broken up

(B) Is very stable

(C) Can be used as fissionable material

(D) Is radioactive

67. Which of the following cannot cause fission in a heavy nucleus

(A) α-particle (B) Proton

(C) Deutron (D) Laser rays

68. The energy in *MeV* is released due to transformation of 1 *kg* mass completely into energy $(c = 3\times10^8\, m/s)$

(A) $7.625\times10\, MeV$ (B) $10.5\times10^{29}\, MeV$

(C) $2.8\times10^{-28}\, MeV$ (D) $5.625\times10^{29}\, MeV$

69. If in a nuclear fission, piece of uranium of mass 0.5 *g* is lost, the energy obtained in *kWh* is

(A) 1.25×10^7 (B) 2.25×10^7

(C) 3.25×10^7 (D) 0.25×10^7

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

(A) ${}_{53}I^{142}$ (B) ${}_{56}Ba^{139}$

(C) ${}_{58}Ce^{139}$ (D) ${}_{54}Xe^{139}$

Radioactivity

71. 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

72. The average life T and the decay constant λ of a radioactive nucleus are related as

(A) $T\lambda = 1$ (B) $T = \frac{0.693}{\lambda}$

(C) $\frac{T}{\lambda} = 1$ (D) $\lambda_1, \lambda_2, \lambda_3$

73. If T is the half life of a radioactive material, then the fraction that would remain after a time $\frac{T}{2}$ is

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$

(C) $\frac{1}{\sqrt{2}}$ (D) $\frac{\sqrt{2}-1}{\sqrt{2}}$

74. 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 be written as $ln\,2$)

(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 $\frac{1}{\lambda}$

75. 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

76. The half life of a radioactive element which has only $\frac{1}{32}$ of its original mass left after a lapse of 60 days is

(A) 12 days (B) 32 days

(C) 60 days (D) 64 days

77. The half-life of Bi^{210} is 5 days. What time is taken by $(7/8)^{th}$ part of the sample to decay
(A) 3.4 days (B) 10 days
(C) 15 days (D) 20 days

78. 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
(A) 172 and 69 (B) 174 and 70
(C) 176 and 69 (D) 176 and 70

79. Radioactivity is
(A) Irreversible process
(B) Self disintegration process
(C) Spontaneous process
(D) All of the above

80. Half life of radioactive element depends upon
(A) Amount of element present
(B) Temperature
(C) Pressure
(D) Nature of element

81. If the half life of a radioactive sample is 10 *hours*, its mean life is
(A) 14.4 *hours* (B) 7.2 *hours*
(C) 20 *hours* (D) 6.93 *hours*

82. If 20 *gm* of a radioactive substance due to radioactive decay reduces to 10 *gm* in 4 minutes, then in what time 80 *gm* of the same substance will reduce to 10 *gm*
(A) In 8 *minutes* (B) In 12 *minutes*
(C) In 16 *minutes* (D) In 20 *minutes*

83. 16 *gm* sample of a radioactive element is taken from Bombay to Delhi in 2 *hour* and it was found that 1 *gm* of the element remained (undisintegrated). Half life of the element is
(A) 2 *hour* (B) 1 *hour*
(C) $\frac{1}{2}$ *hour* (D) $\frac{1}{4}$ *hour*

84. Unit of radioactivity is *Rutherford*. Its value is
(A) 3.7×10^{10} *disi tegrations/sec*
(B) 3.7×10^{6} *disintegrations/sec*
(C) 1.0×10^{10} *disintegrations/sec*
(D) 1.0×10^{6} *disintegrations/sec*

85. In which radioactive disintegration, neutron dissociates into proton and electron
(A) He^{++} emission (B) $\beta-$emission
(C) $\gamma-$emission (D) Positron emission

86. The count rate of a 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) $20\,s^{-1}$

87. What is the respective number of α and β particles emitted in the following radioactive decay ${}_{90}X^{200} \rightarrow {}_{80}Y^{168}$
(A) 6 and 8 (B) 8 and 8
(C) 6 and 6 (D) 8 and 6

88. A radioactive reaction is ${}_{92}U^{238} \rightarrow {}_{82}Pb^{206}$. How many α and β particles are emitted
(A) $10\alpha, 6\beta$
(B) 4 protons, 8 neutrons
(C) 6 electrons, 8 protons
(D) $6\beta, 8\alpha$

89. A radioactive substance has a half life of 60 *minutes*. After 3 *hours*, the fraction of atom that have decayed would be
(A) 12.5% (B) 87.5%
(C) 8.5% (D) 25.1%

90. A element used for radioactive carbon dating for more than 5600 years is
(A) $C-14$ (B) $U-234$
(C) $U-238$ (D) $Po-94$

91. The nucleus ${}^{115}_{48}Cd$ after two successive β^- decays will give
(A) ${}^{115}_{46}Pa$ (B) ${}^{114}_{49}In$
(C) ${}^{113}_{50}Sn$ (D) ${}^{115}_{50}Sn$

92. A radioactive sample with a half life of 1 month has the label : "Activity=2 *micro curies* on 1.8.1991." What will be its activity two months later
(A) 1.0 *micro curies* (B) 0.5 *micro curies*
(C) 4 *micro curies* (D) 8 *micro curies*

93. An element A decays into element C by a two step process :

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

$B \to C + 2e^-$

Then

(A) A and C are isotopes
(B) A and C are isobars
(C) A and B are isotopes
(D) A and B are isobars

94. At any instant the ratio of the amount of radioactive substances is 2 : 1. If their half lives be respectively 12 and 16 *hours*, then after two days, what will be the ratio of the substances

(A) 1 : 1 (B) 2 : 1
(C) 1 : 2 (D) 1 : 4

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

(A) K^{40} (B) Co^{60}
(C) Sr^{90} (D) I^{131}

96. If half-life of a radioactive atom is 2.3 *days*, then its decay constant would be

(A) 0.1 (B) 0.2
(C) 0.3 (D) 2.3

97. A radioactive element ${}_{90}X^{238}$ decay into ${}_{83}Y^{222}$. The number of $\beta-$particles emitted are

(A) 4 (B) 6
(C) 2 (D) 1

98. A radio isotope has a half life of 75 *years*. The fraction of the atoms of this material that would decay in 150 *years* will be

(A) 66.6% (B) 85.5%
(C) 62.5% (D) 75%

99. The activity of a radioactive sample is measured as 9750 counts *per minute* at $t = 0$ and as 975 counts *per minute* at $t = 5$ *minutes*. The decay constant is approximately

(A) 0.230 *per minute* (B) 0.461 *per minute*
(C) 0.691 *per minute* (D) 0.922 *per minute*

100. An artificial radioactive decay series begins with unstable ${}^{241}_{94}Pu$. The stable nuclide obtained after eight $\alpha-$decays and five $\beta-$decays is

(A) ${}^{209}_{83}Bi$ (B) ${}^{209}_{82}Pb$
(C) ${}^{205}_{82}Ti$ (D) ${}^{201}_{82}Hg$

101. Which is the correct expression for half-life

(A) $(t)_{1/2} = \log 2$ (B) $(t)_{1/2} = \dfrac{\lambda}{\log 2}$
(C) $(t)_{1/2} = \dfrac{\lambda}{\log 2}(2.303)$ (D) $(t)_{1/2} = \dfrac{2.303 \log 2}{\lambda}$

102. A nucleus ${}^{A}_{Z}X$ emits an α-particle. The resultant nucleus emits a β^+ particle. The respective atomic and mass no. of the final nucleus will be

(A) Z – 3, $A - 4$ (B) Z – 1, $A - 4$
(C) Z – 2, $A - 4$ (D) Z, $A - 2$

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

(A) Whole (B) Half
(C) One-fourth (D) Three-fourth

104. 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*

105. In a mean life of a radioactive sample

(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

106. Three fourth of the active decays in a radioactive sample in 3/4 *sec*. The half life of the sample is

(A) $\dfrac{1}{2}$ *sec* (B) 1 *sec*
(C) $\dfrac{3}{8}$ *sec* (D) $\dfrac{3}{4}$ *sec*

107. During mean life of a radioactive element, the fraction that disintegrates is

(A) e (B) $\frac{1}{e}$

(C) $\frac{e-1}{e}$ (D) $\frac{e}{e-1}$

108. 1 Curie is equal to

(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*

109. In the given nuclear reaction, how many α and β particles are emitted ${}_{92}X^{235} \rightarrow {}_{82}Y^{207}$

(A) 3α particles and 2β particle

(B) 4α particles and 3β particle

(C) 6α particles and 4β particle

(D) 7α particles and 4β particle

110. The electron emitted in beta radiation originates from

(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

111. When ${}_{90}Th^{228}$ transforms to ${}_{83}Bi^{212}$, then the number of the emitted α- and β-particles is, respectively

(A) $8\alpha, 7\beta$ (B) $4\alpha, 7\beta$

(C) $4\alpha, 4\beta$ (D) $4\alpha, 1\beta$

112. 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) ${}^{A}X_{Z} + e_{-1} \rightarrow {}^{A}X_{Z-1} + g$

113. The half-life of ${}^{215}At$ is $100\mu s$. The time taken for the radioactivity of a sample of ${}^{215}At$ to decay to $1/16^{\text{th}}$ of its initial value is

(A) $400\,\mu s$ (B) $6.3\,\mu s$

(C) $40\,\mu s$ (D) $300\,\mu s$

114. 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

(A) 12 *h* (B) 16 *h*

(C) 48 *h* (D) 192 *h*

115. A radioactive substance has an average life of 5 hours. In a time of 5 hours

(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

116. Which of the following rays are not electromagnetic waves

(A) γ-rays (B) β-rays

(C) Heat rays (D) X-rays

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

(A) 2.50 *gm* (B) 3.70 *gm*

(C) 6.30 *gm* (D) 1.35 *gm*

118. Which of the following radiations has the least wavelength

(A) X-rays (B) γ-rays

(C) β-rays (D) α-rays

119. 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 In 2 (B) 0.4 In 2

(C) 0.2 In 2 (D) 0.1 In 2

120. 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

(A) 74 (B) 76

(C) 78 (D) 82