ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

path to success

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PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Modern Physics-II

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions)

Build Up Your Understanding

NUCLEAR PHYSICS

1. Let F_{pp}, F_{pn} and F_{nn} denote the nuclear force between proton–proton, proton–neutron and neutron–neutron pair respectively. When separation is 1 fm :-

(1) $F_{pp} < F_{pn} = F_{nn}$ (2) $F_{pp} > F_{pn} = F_{nn}$
(3) $F_{pp} = F_{pn} = F_{nn}$ (4) $F_{pp} < F_{pn} < F_{nn}$

MP0149

2. A nuclear fission is given below

$A^{240} \rightarrow B^{100} + C^{140} + Q(\text{energy})$

Let binding energy per nucleon of nucleus A, B and C is 7.6 MeV, 8.1 MeV and 8.1 MeV respectively. Value of Q is :-(Approximately)

(1) 20 MeV (2) 220 MeV
(3) 120 MeV (4) 240 MeV

MP0150

3. How much energy will be released when 10 kg of U^{235} is completely converts into energy :-

(1) 5×10^{27} MeV (2) 5×10^{24} MeV
(3) 9×10^{17} J (4) All of these

MP0151

4. How much energy is released when 2 mole of U^{235} is fissioned :-

(1) 10^{24} MeV (2) 24×10^{25} MeV
(3) 10^{24} J (4) 10^{24} kWh

MP0152

5. As the mass number increases, binding energy per nucleon :-

(1) increases
(2) decreases
(3) remains same
(4) may increase or may decrease

MP0153

6. Possible forces on a proton by a proton in a nucleus is/are :-

(1) Coulomb force (2) Nuclear force
(3) Gravitational force (4) All of these

MP0154

7. The energy radiated by a red giant star produces by :-

(1) Fission process
(2) Fusion process
(3) Chemical burning of hydrogen
(4) Gravitational contraction

MP0155

8. In the process of atomic explosion, the most of fission energy is released in the form of :–

(1) γ - rays
(2) Kinetic energy of products
(3) Infra red rays
(4) Visible light

MP0156

9. Which of the following nucleus is fissionable by slow neutrons :-

(1) ${}_{92}U^{238}$ (2) ${}_{93}Np^{239}$
(3) ${}_{92}U^{235}$ (4) ${}_{2}He^{4}$

MP0157

10. The example of nuclear fusion is .

(1) formation of barium and krypton from uranium
(2) formation of helium from hydrogen
(3) formation of plutonium –235 from uranium –235
(4) formation of water from hydrogen and oxygen

MP0158

11. Electron - positron pair can be created by γ-rays. In this process the minimum energy of γ-rays should be :-

(1) 5.0 MeV (2) 4.02 MeV
(3) 15.0 MeV (4) 1.02 MeV

MP0159

12. For nuclear reaction :

${}_{92}U^{235} + {}_{0}n^{1} \rightarrow {}_{56}Ba^{144} + \ldots\ldots\ldots + 3\,{}_{0}n^{1}$

(1) ${}_{26}Kr^{89}$ (2) ${}_{36}Kr^{89}$
(3) ${}_{26}Sr^{90}$ (4) ${}_{38}Sr^{89}$

MP0160

13. For the given reaction, the particle X is -

${}_{6}C^{11} \rightarrow {}_{5}B^{11} + \beta^{+} + X$

(1) Neutron
(2) Anti neutrino
(3) Neutrino
(4) Proton

MP0161

14. In a breeder reactor, useful fuel obtained from U^{238} is :

(1) Ac^{233} (2) Th^{238}
(3) U^{235} (4) Pu^{239}

MP0162

15. Boron used in Atomic Reactor for:-

(1) absorbption of neutrons
(2) absorbption of α - particles
(3) speed up the reaction
(4) change the reaction

MP0163

16. Who discovered the nuclear fission :-
(1) Otto Hahn and strassman
(2) Fermi
(3) Baithe
(4) Rutherford

MP0164

17. Which one is best neutron moderator in all respects:
(1) Barium oxide (2) Water
(3) Graphite (4) Heavy water

MP0165

18. X(n, α) ${}^{7}_{3}Li$, then the element X will be :–
(1) ${}^{10}_{5}B$ (2) ${}^{9}_{5}B$
(3) ${}^{11}_{4}Be$ (4) ${}^{4}_{2}He$

MP0166

19. M_n and M_p represent the mass of neutron and proton respectively. An element having nuclear mass M has N neutrons and Z-protons, then the correct relation will be :-
(1) $M<\{N.M_n+Z.M_p\}$ (2) $M>\{N.M_n+Z.M_p\}$
(3) $M=\{N.M_n+Z.M_p\}$ (4) $M=N\{M_n + M_p\}$

MP0167

20. Energy is released in nuclear fission is due to
(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 equals to the B.E. of parental element is
(1) a,c (2) a,b (3) a,d (4) All

MP0168

21. Energy in an atom bomb is produced by the process of :
(1) nuclear fusion
(2) nuclear fission
(3) combination of hydrogen atoms
(4) combination of electrons and protons

MP0169

22. Assuming that 200 MeV of energy is released per fission of ${}_{92}U^{235}$ atom. Find the number of fission per second required to release 1 kW power :-
(1) 3.125×10^{13} (2) 3.125×10^{14}
(3) 3.125×10^{15} (4) 3.125×10^{16}

MP0170

23. 1 a.m.u. (1.66×10^{-27} kg) is equal to
(1) 139 MeV/c^2 (2) 39 MeV/c^2
(3) 93 MeV/c^2 (4) 931 MeV/c^2

MP0171

24. In nuclear fission the percentage of mass converted into energy is about :-
(1) 0.1% (2) 1%
(3) 10% (4) 0.01%

MP0172

25. Which of the following are suitable for the fusion process :-
(1) Light nuclei
(2) heavy nuclei
(3) Element must be lying in the middle of the periodic table
(4) Middle elements, which are lying on binding energy curve

MP0173

26. Which one of the following particle is unstable ?
(1) α-particle (2) electron
(3) proton (4) neutron

MP0174

27. Which of the following is weakest force :-
(1) Gravitational force (2) Electric force
(3) Magnetic force (4) Nuclear force

MP0175

28. The volume occupied by an atom is greater than the volume of the nucleus by a factor of about :-
(1) 10^1 (2) 10^5
(3) 10^{10} (4) 10^{15}

MP0176

29. The mass of proton is 1.0073 u and that of neutron is 1.0087 u (u = atomic mass unit). The binding energy of ${}_{2}^{4}He$ is :-
(1) 0.0305 J (2) 0.0305 erg
(3) 28.4 MeV (4) 0.061 u
(Given:- mass of helium nucleus 4.0015 u)

MP0177

30. The mass number of a nucleus is
(1) always less than its atomic number
(2) always more than its atomic number
(3) may equal to its atomic number
(4) sometimes less than and sometimes more than its atomic number

MP0178

31. In the following reaction X is :–

${}_{20}Ca^{40} + X \rightarrow {}_{21}Sc^{43} + {}_{1}H^{1}$

(1) Electron (2) Positron
(3) alpha particle (4) Proton

MP0179

32. Nuclear fusion is possible :–

(1) only between light nuclei.
(2) only between heavy nuclei.
(3) between both light and heavy nuclei.
(4) only between nuclei which are stable against β–decay.

MP0180

33. The order of nuclear density is

(1) 10^{13} kg/m^3 (2) 10^{15} kg/m^3
(3) 10^{17} kg/m^3 (4) 10^{19} kg/m^3

MP0181

34. Two light nuclei of masses m_1 and m_2 are fused to form a more stable nucleus of mass m_3 then:-

(1) $m_3 = |m_1 - m_2|$ (2) $m_3 < (m_1 + m_2)$
(3) $m_3 > (m_1 + m_2)$ (4) $m_3 = m_1 + m_2$

MP0182

35. A nucleus represented by the symbol ${}^{A}_{Z}X$ has :-

(1) Z protons and A – Z neutrons
(2) Z protons and A neutrons
(3) A protons and Z – A neutrons
(4) Z neutrons and A – Z protons

MP0183

36. 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 velocity of light) :-

(1) $M(N, Z) = NM_n + ZM_p + Bc^2$
(2) $M(N, Z) = NM_n + ZM_p - B/c^2$
(3) $M(N, Z) = NM_n + ZM_p + B/c^2$
(4) $M(N, Z) = NM_n + ZM_p - Bc^2$

MP0184

37. Mass equivalent to energy 931 MeV is

(1) 6.02×10^{-27} kg
(2) 1.66×10^{-27} kg
(3) 16.66×10^{-26} kg
(4) 6.02×10^{-26} kg

MP0185

38. One milligram of matter converted into energy will give

(1) 9 J (2) 9×10^{13} J
(3) 9×10^{5} J (4) 9×10^{10} J

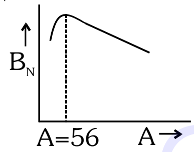
MP0186

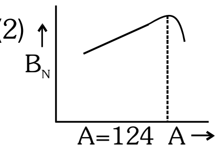
39. Force acting on proton-proton inside a nucleus is–

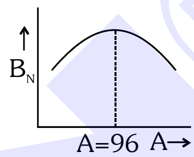
(1) Nuclear force > electric force
(2) Electric force > Nuclear force
(3) Gravitational force > Nuclear force
(4) None of the above

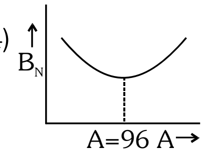
MP0187

40. The dependence of binding energy per nucleon (B_N) on the mass number (A), is represented by

(1) 

(2) 

(3) 

(4) 

MP0188

41. Which one of the following pairs of nuclei are isotones :-

(1) ${}_{34}Se^{74}$, ${}_{31}Ga^{71}$ (2) ${}_{38}Sr^{84}$, ${}_{38}Sr^{86}$
(3) ${}_{42}Mo^{92}$, ${}_{40}Zr^{92}$ (4) ${}_{20}Ca^{40}$, ${}_{16}S^{32}$

MP0189

42. Which one of the following is a possible nuclear reaction :-

(1) ${}^{10}_{5}B + {}^{4}_{2}He \longrightarrow {}^{13}_{7}N + {}^{1}_{1}H$
(2) ${}^{23}_{11}Na + {}^{1}_{1}H \longrightarrow {}^{22}_{10}Ne + {}^{4}_{2}He$
(3) ${}^{239}_{93}Np \longrightarrow {}^{239}_{94}Pu + \beta^- + \bar{\nu}$
(4) ${}^{11}_{7}N + {}^{1}_{1}H \longrightarrow {}^{12}_{6}C + \beta^- + \nu$

MP0190

43. In the reaction ${}^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n$. If the binding energies of ${}^{2}_{1}H$, ${}^{3}_{1}H$ and ${}^{4}_{2}He$ are respectively a, b and c (in MeV), then the energy (in MeV) released in this reaction is

(1) a + b – c (2) c + a – b
(3) c – a – b (4) a + b + c

MP0191

44. In any fission process the ratio $\dfrac{\text{mass of fission products}}{\text{mass of parent nucleus}}$ is –

(1) Greater than 1
(2) Depends on the mass of the parent nucleus
(3) Equal to 1
(4) Less than 1

MP0192

45. Fission of nuclei is possible because the binding energy per nucleon in them –
(1) Decreases with mass number at low mass numbers.
(2) Increases with mass number at low mass numbers.
(3) Decreases with mass number at high mass numbers.
(4) Increases with mass number at high mass numbers.
MP0193

46. The main function of moderators in nuclear reactors is to :-
(1) decrease the energy of neutrons
(2) absorb the extra neutrons
(3) provide shield from nuclear radiations
(4) provide cooling
MP0194

RADIOACTIVITY

47. Probability of survival of a radioactive nucleus in one mean life is :-
(1) $\frac{1}{2}$ (2) $\frac{1}{e}$ (3) $\frac{1}{4}$ (4) $\frac{1}{5}$
MP0195

48. Ratio of initial active nuclei in two different samples is 2 : 3. Their half lives are one hour and two hours respectively. Ratio of active nuclei at the end of 6 hours will be :-
(1) 1 : 1 (2) 1 : 12 (3) 4 : 3 (4) 3 : 4
MP0196

49. Atomic weight of a radioactive element is M_w gram. Radioactivity of m gram. of its mass is :–
(N_A = Avogadro number, λ = decay constant)
(1) $N_A\,\lambda$ (2) $\left(\frac{N_A}{M_w}m\right)\lambda$
(3) $\left(\frac{N_A}{m}\right)\lambda$ (4) $\left(\frac{N_A}{m}M_w\right)\lambda$
MP0197

50. Which spectrum is continuous
(1) α–rays (2) β–rays
(3) γ–rays (4) All of these
MP0198

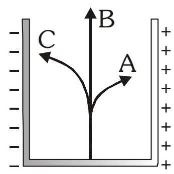
51. Which statement about radioactive radiations is true
(1) Speed of α-particles is a characteristic property.
(2) Speed of β-particles is a characteristic property.
(3) Speed of γ-photon is a characteristic property.
(4) All of these.
MP0199

52. Which one moves with greatest speed :-
(1) α-rays (2) β–rays
(3) γ–rays (4) cathode rays
MP0200

53. For a radioactive sample, at given instant, number of active nuclei is N and its decay constant is λ then the incorrect relation is–
(1) $N\lambda$ = activity at given instant.
(2) λ = decay probability per unit time for a nucleus
(3) After the next $\frac{1}{\lambda}$ time interval, active nuclei in the sample will be $N\left(1-\frac{1}{e}\right)$
(4) The half life of the sample = $\frac{\ell n2}{\lambda}$
MP0201

54. If a nucleus is emitting e^- particle, its neutron to proton ratio (n/p) will :–
(1) Increase.
(2) Decrease
(3) Remain unchanged
(4) Can't be determind.
MP0202

55. A radioactive source is kept in an uniform electric field α, β and γ- particle are emitting. α,β,γ are respectively :-
(1) A,B,C
(2) A,C,B
(3) C,A,B
(4) C,B,A



MP0203

56. The rate of disintegration of a radioactive sample can be increased by :-
(1) Increasing the temperature
(2) Increasing the pressure
(3) Chemical reaction
(4) It is not possibe
MP0204

57. In a radioactive decay, neither the atomic number nor the mass number changes. Which of the following would be emitted in the decay process.
(1) Proton (2) Neutron
(3) Electron (4) Photon
MP0205

58. At some instant two radioactive substance are having amount in ratio of 2 : 1. Their half lives are 12 hrs and 16 hrs then after two days the ratio of their quantities is

(1) 1 : 1 (2) 2 : 1 (3) 1 : 2 (4) 1 : 4

MP0206

59. The isotope used for curing the cancer is :

(1) K (40) (2) Co (60)

(3) Sr (90) (4) I (131)

MP0207

60. 'Rn' decays into 'Po' by emitting α - particle with half life of 4 days. A sample contains 6.4×10^{10} atoms of Rn. After 12 days, the number of atoms of 'Rn' left in the sample will be-

(1) 3.2×10^{10} (2) 0.53×10^{10}

(3) 2.1×10^{10} (4) 0.8×10^{10}

MP0208

61. Neutrino is a particle, which is :

(1) charged like an electron and has no spin

(2) chargeless and has spin

(3) chargeless and has no spin

(4) charged like an electron and has spin

MP0209

62. A radioactive element ${}_{90}X^{238}$ decays in to ${}_{83}Y^{222}$. The number of β - particles emitted is :

(1) 2 (2) 4 (3) 6 (4) 1

MP0210

63. The relation between λ and $T_{1/2}$ as :- ($T_{1/2} \rightarrow$ half life, $\lambda \rightarrow$ decay constant)

(1) $T_{1/2} = \frac{\ell n2}{\lambda}$ (2) $T_{1/2}\, \ell n2 = \lambda$

(3) $T_{1/2} = \frac{1}{\lambda}$ (4) $(\lambda + T_{1/2}) = \frac{\ell n2}{2}$

MP0211

64. The half life of a radioactive material is 5 years. The probability of disintegration for a nucleus in 10 years is :-

(1) 0.50 (2) 0.25

(3) 0.60 (4) 0.75

MP0212

65. 10.24 g radioactive substance has half life 3.8 days. After 19 days, its remaining quantity is :-

(1) 0.151 g (2) 0.32 g

(3) 1.51 g (4) 0.16 g

MP0213

66. A radioactive reaction is ${}_{92}U^{238} \rightarrow {}_{82}Pb^{206}$. How many α and β particles are emitted ?

(1) 10α, 6β

(2) 4 proton, 8 neutron

(3) 6 electron, 8 proton

(4) 6β, 8α

MP0214

67. Which rays contain (+ Ve) charged particle:–

(1) α–rays (2) β–rays

(3) γ–rays (4) X–rays

MP0215

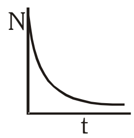
68. Half life of radioactive element is 12.5 Hour and its quantity is 256 gram. After how much time its quantity will remain 1 gram :–

(1) 50 Hrs (2) 100 Hrs

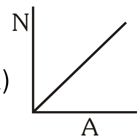
(3) 150 Hrs (4) 200 Hrs

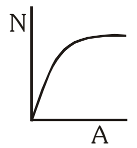
MP0216

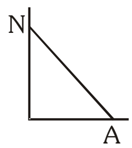
69. The number of undecayed nuclei N in a sample of radioactive material as a function of time is shown in the graph

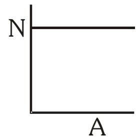


Which of the following graph correctly shows the relationship between N and the activity A ?

(1) 

(2) 

(3) 

(4) 

MP0217

70. A sample of radioactive element containing 4×10^{16} active nuclei. Half life of element is 10 days, then number of decayed nuclei after 30 days :-

(1) 0.5×10^{16} (2) 2×10^{16}

(3) 3.5×10^{16} (4) 1×10^{16}

MP0218

71. When ${}_{90}Th^{238}$ changes into ${}_{83}Bi^{222}$, then the number of emitted α and β-particles are :-

(1) 8α, 7β (2) 4α, 7β

(3) 4α, 4β (4) 4α, 1β

MP0219

72. A radioactive nucleus decay as follows :-

$X \xrightarrow{\alpha} X_1 \xrightarrow{\beta} X_2 \xrightarrow{\alpha} X_3 \xrightarrow{\gamma} X_4,$

if the atomic number and the mass number of X are 72 and 180 then the mass number and atomic number of X_4 are :-

(1) 172, 70 (2) 171,69

(3) 172, 69 (4) 172, 68

MP0220

73. The decay constant of a radioactive sample is λ. The respective values of its half life and meanlife are :-

(1) $\frac{1}{\lambda}$ and $(\log_e 2)$ (2) $\frac{\log_e 2}{\lambda}$ and $\frac{1}{\lambda}$

(3) $\lambda(\log_e 2)$ and $\frac{1}{\lambda}$ (4) $\frac{2}{\lambda}$ and $\frac{1}{\lambda}$

MP0221

74. In a mean life of a radioactive sample :-

(1) About 1/3 of substance disintegrate

(2) About 2/3 of substance disintegrate

(3) About 90% of the substance disintegrate

(4) Almost all the substance disintegrates

MP0222

75. Activity of a radioactive element is 10^3 dps. Its half life is 1 second. After 3 seconds, its activity will be (dps = decay per second) :-

(1) 1000 dps (2) 250 dps

(3) 125 dps (4) None of these

MP0223

76. A sample of radioactive element has a mass of 10 gram at an instant t = 0. The approximate mass of this element in the sample after two mean lives is :-

(1) 1.35 gram (2) 2.50 gram

(3) 3.70 gram (4) 6.30 gram

MP0224

77. Which of the following ray are **not** electromagnetic waves :-

(1) X-rays (2) γ-rays

(3) β-rays (4) Heat rays

MP0225

78. A radioactive substance decays to $1/16^{th}$ of its initial activity in 40 days. The half–life of the radioactive substance expressed in days is :–

(1) 2.5 (2) 5 (3) 10 (4) 20

MP0226

79. A nuclear reaction given by

${}_{Z}X^{A} \rightarrow {}_{Z+1}Y^{A} + {}_{-1}e^{0} + \bar{\nu}$ represents

(1) β-decay (2) γ-decay (3) fusion (4) fission

MP0227

80. If half-life of a radioactive substance is 60 minutes, then the percentage decay in 4 hours is :

(1) 50% (2) 71% (3) 85% (4) 93.7%

MP0228

81. The active amount of radioactive substance left after one hour whose half life is 20 minutes is :

(1) $\frac{1}{8}$ (2) $\frac{1}{32}$ (3) $\frac{1}{16}$ (4) $\frac{1}{9}$

MP0229

82. Initial decay rate of a substance is 800 disintegration/sec. If half life of substance is 1 sec. then after three second the decay rate will be :–

(1) 800 disintegration/sec.

(2) 400 disintegration/sec.

(3) 200 disintegration/sec.

(4) 100 disintegration/sec.

MP0230

83. Plutonium - decays with a half life of 24000 years. If plutonium is stored for 72000 years, then the fraction of plutonium that remains, is

(1) 1/8 (2) 1/4 (3) 1/3 (4) 1/2

MP0231

84. Which of the following radiations gets deflected by a magnetic field ?

(1) X-rays (2) γ-rays
(3) β-rays (4) radio waves

MP0232

85. Fraction of tritium left after 125 years (half life of tritium is 12.5 years) is

(1) 1/1024 (2) 1/2048
(3) 1/4096 (4) 1/8192

MP0233

86. α–Particles can be detected using :–

(1) Thin aluminium sheet
(2) Barium sulphate
(3) Zinc sulphide screen
(4) Gold foil

MP0234

87. If half life period of radium is 1600 years then its average life is (approx) –

(1) 4200 years (2) 3530 years
(3) 2300 years (4) 2800 years

MP0235

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**3**	**3**	**2**	**4**	**4**	**2**	**2**	**3**	**2**	**4**	**2**	**3**	**4**	**1**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**4**	**1**	**1**	**2**	**2**	**1**	**4**	**1**	**1**	**4**	**1**	**4**	**3**	**3**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**3**	**1**	**3**	**2**	**1**	**2**	**2**	**4**	**1**	**1**	**1**	**3**	**3**	**4**	**3**
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**1**	**2**	**2**	**2**	**2**	**1**	**3**	**3**	**2**	**3**	**4**	**4**	**1**	**2**	**4**
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	**2**	**4**	**1**	**4**	**2**	**4**	**1**	**2**	**1**	**3**	**4**	**3**	**2**	**2**	**3**
Que.	76	77	78	79	80	81	82	83	84	85	86	87			
Ans.	**1**	**3**	**3**	**1**	**4**	**1**	**4**	**1**	**3**	**1**	**3**	**3**			

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. The binding energy of deutron is 2.2 MeV and that of ${}^4_2He$ is 28 MeV. If two deutrons are fused to form one ${}^4_2He$ then the energy released is :

(1) 25.8 MeV (2) 23.6 MeV
(3) 19.2 MeV (4) 30.2 MeV

MP0236

2. The radius of Germanium (Ge) nuclide is measured to be twice the radius of ${}^9_4Be$. The number of nucleons in Ge are :-

(1) 73 (2) 74 (3) 75 (4) 72

MP0237

3. In a radioactive material the activity at time t_1 is R_1 and at a later time t_2, it is R_2. If the decay constant of the material is λ, then :

(1) $R_1 = R_2\, e^{-\lambda(t_1-t_2)}$ (2) $R_1 = R_2\, e^{\lambda(t_1-t_2)}$
(3) $R_1 = R_2\,(t_2/t_1)$ (4) $R_1 = R_2$

MP0238

AIPMT 2007

4. If the nucleus ${}^{27}_{13}A\ell$ has a nuclear radius of about 3.6 fm, the ${}^{125}_{52}Te$ would have its radius approximately as :-

(1) 4.8 fm (2) 6.0 fm
(3) 9.6 fm (4) 12.0 fm

MP0241

5. In radioactive decay process, the negatively charged emitted β - particles are :-

(1) the electrons orbiting around the nucleus
(2) the electrons present inside the nucleus
(3) the electrons produced as a result of the decay of neutrons inside the nucleus
(4) the electrons produced as a result of collisions between atoms

MP0242

AIPMT 2009

6. The number of beta particles emitted by a radioactive substance is twice the number of alpha particles emitted by it. The resulting daughter is an-

(1) isotope of parent
(2) isobar of parent
(3) isomer of parent
(4) isotone of parent

MP0243

7. In the nuclear decay given below :

$${}^A_ZX \longrightarrow {}^{A}_{Z+1}Y \longrightarrow {}^{A-4}_{Z-1}B^* \longrightarrow {}^{A-4}_{Z-1}B,$$

the particles emitted in the sequence are :-

(1) α, β, γ (2) β, α, γ (3) γ, β, α (4) β, γ, α

MP0244

AIPMT (Pre) 2010

8. The mass of a ${}^7_3Li$ nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of ${}^7_3Li$ nucleus is nearly :-

(1) 23 MeV (2) 46 MeV
(3) 5.6 MeV (4) 3.9 MeV

MP0245

9. The activity of a radioactive sample is measured as N_0 counts per minute at t = 0 and N_0/e counts per minute at t = 5 minutes. The time (in minutes) at which the activity reduces to half its value is :-

(1) $5 \log_e 2$ (2) $\log_e 2/5$
(3) $\dfrac{5}{\log_e 2}$ (4) $5 \log_{10} 2$

MP0246

AIPMT (Mains) 2010

10. The binding energy per nucleon in deuterium and helium nuclei are 1.1 MeV and 7.0 MeV, respectively. When two deuterium nuclei fuse to form a helium nucleus the energy released in the fusion is :-

(1) 2.2 MeV (2) 28.0 MeV
(3) 30.2 MeV (4) 23.6 MeV

MP0247

11. The decay constant of a radio isotope is λ. If A_1 and A_2 are its activities at times t_1 and t_2 respectively, the number of nuclei which have decayed during the time $(t_1 - t_2)$:-

(1) $A_1 - A_2$ (2) $(A_1 - A_2)/\lambda$
(3) $\lambda(A_1 - A_2)$ (4) $A_1t_1 - A_2t_2$

MP0248

AIPMT (Pre) 2011

12. The power obtained in a reactor using U^{235} disintegration is 1000 kW. The mass decay of U^{235} per hour is :-

(1) 10 microgram (2) 20 microgram
(3) 40 microgram (4) 1 microgram

MP0249

13. The half life of a radioactive isotope 'X' is 50 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio of 1 : 15 in a sample of a given rock. The age of the rock was estimated to be :-

(1) 150 years (2) 200 years
(3) 250 years (4) 100 years

MP0250

14. A nucleus ${}_{n}^{m}X$ emits one α particle and two β^- particles. The resulting nucleus is :-

(1) ${}_{n-4}^{m-6}Z$ (2) ${}_{n}^{m-6}Z$ (3) ${}_{n}^{m-4}X$ (4) ${}_{n-2}^{m-4}Y$

MP0251

AIPMT (Mains) 2011

15. Two radioactive nuclei P and Q in a given sample decay into a stable nucleus R. At time t = 0, number of P species are 4 N_0 and that of Q are N_0. Half-life of P (for conversion to R) is 1 minute where as that of Q is 2 minutes. Initially there are no nuclei of R present in the sample. When number of nuclei of P and Q are equal, the number of nuclei of R present in the sample would be :-

(1) $2N_0$ (2) $3N_0$ (3) $\frac{9N_0}{2}$ (4) $\frac{5N_0}{2}$

MP0252

AIPMT (Pre) 2012

16. If the nuclear radius of ^{27}Al is 3.6 Fermi, the approximate nuclear radius of ^{64}Cu in Fermi is :

(1) 4.8 (2) 3.6 (3) 2.4 (4) 1.2

MP0253

17. A mixture consists of two radioactive materials A_1 and A_2 with half lives of 20 s and 10 s respectively. Initially the mixture has 40 g of A_1 and 160g of A_2. The active amount of the two in the mixture will becomes equal after :

(1) 20s (2) 40s
(3) 60s (4) 80s

MP0254

AIPMT (Mains) 2012

18. The half life of a radioactive nucleus is 50 days. The time interval $(t_2 - t_1)$ between the time t_2 when 2/3 of it has decayed and the time t_1 when 1/3 of it had decayed is :-

(1) 60 days (2) 15 days
(3) 30 days (4) 50 days

MP0255

NEET-UG 2013

19. A certain mass of Hydrogen is changed to Helium by the process of fusion. The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is : (given 1u = 931 MeV)

(1) 13.35 MeV (2) 2.67 MeV
(3) 26.7 MeV (4) 6.675 MeV

MP0256

20. The half life of a radioactive isotope 'X' is 20 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio 1 : 7 in a sample of a given rock. The age of the rock is estimated to be:

(1) 100 years (2) 40 years
(3) 60 years (4) 80 years

MP0257

AIPMT 2014

21. The Binding energy per nucleon of ${}_{3}^{7}Li$ and ${}_{2}^{4}He$ nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction ${}_{3}^{7}Li + {}_{1}^{1}H \rightarrow 2\,{}_{2}^{4}He + Q$, the value of energy Q released is:-

(1) 19.6 MeV (2) –2.4 MeV
(3) 8.4 MeV (4) 17.3 MeV

MP0263

22. A radio isotope 'X' with a half life 1.4×10^9 years decays to 'Y' which is stable. A sample of the rock from a cave was found to contain 'X' and 'Y' in the ratio 1 : 7. The age of the rock is :

(1) 1.96×10^9 years (2) 3.92×10^9 years
(3) 4.20×10^9 years (4) 8.40×10^9 years

MP0264

AIPMT 2015

23. If radius of the ${}_{13}^{27}Al$ nucleus is taken to be R_{Al} then the radius of ${}_{53}^{125}Te$ nucleus is nearly :

(1) $\frac{5}{3}R_{Al}$ (2) $\frac{3}{5}R_{Al}$

(3) $\left(\frac{13}{53}\right)^{1/3} R_{Al}$ (4) $\left(\frac{53}{13}\right)^{1/3} R_{Al}$

MP0265

RE-AIPMT 2015

24. A nucleus of uranium decays at rest into nuclei of Thorium and Helium. Then :-

(1) The Helium nucleus has less kinetic energy than the Thorium nucleus

(2) The Helium has more kinetic energy than the Thorium nucleus.

(3) The Helium nucleus has less momentum than the Thorium nucleus.

(4) The Helium nucleus has more momentum than the Thorium nucleus.

MP0266

NEET-II 2016

25. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is :-

(1) 45 (2) 60 (3) 15 (4) 30

MP0270

NEET(UG) 2017

26. Radioactive material 'A' has decay constant '8 λ' and material 'B' has decay constant 'λ'. Initially they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be e ?

(1) $\frac{1}{7\lambda}$ (2) $\frac{1}{8\lambda}$ (3) $\frac{1}{9\lambda}$ (4) $\frac{1}{\lambda}$

MP0275

NEET(UG) 2018

27. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is :-

(1) 20 (2) 10

(3) 30 (4) 15

MP0276

NEET(UG) 2019

28. α-particle consists of :

(1) 2 protons and 2 neutrons only

(2) 2 electrons, 2 protons and 2 neutrons

(3) 2 electrons and 4 protons only

(4) 2 protons only

MP0343

NEET(UG) 2019 (Odisha)

29. The rate of radioactive disintegration at an instant for a radioactive sample of half life 2.2×10^9 s is 10^{10} s^{-1}. The number of radioactive atoms in that sample at that instant is,

(1) 3.17×10^{20}

(2) 3.17×10^{17}

(3) 3.17×10^{18}

(4) 3.17×10^{19}

MP0344

NEET(UG) 2020

30. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and:

(1) $^{103}_{36}Kr$ (2) $^{144}_{56}Ba$

(3) $^{91}_{40}Zr$ (4) $^{101}_{36}Kr$

MP0477

31. The energy equivalent of 0.5 g of a substance is:

(1) 0.5×10^{13} J

(2) 4.5×10^{16} J

(3) 4.5×10^{13} J

(4) 1.5×10^{13} J

MP0478

NEET(UG) 2020 (COVID-19)

32. What happens to the mass number and atomic number of an element when it emits γ-radiation?

(1) Mass number decreases by four and atomic number decreases by two.

(2) Mass number and atomic number remain unchanged.

(3) Mass number remains unchanged while atomic number decreases by one.

(4) Mass number increases by four and atomic number increases by two.

MP0479

33. The half life of radioactive sample undergoing α-decay is 1.4×10^{17} s. If the number of nuclei in the sample is 2.0×10^{21}, the activity of the sample is nearly :

(1) 10^4 *Bq* (2) 10^5 *Bq*
(3) 10^6 *Bq* (4) 10^3 *Bq*

MP0480

NEET(UG) 2021

34. A nucleus with mass number 240 breaks into two fragments each of mass number 120, the binding energy per nucleon of unfragmented nuclei is 7.6 MeV while that of fragments is 8.5 MeV. The total gain in the Binding Energy in the process is :

(1) 0.9 MeV (2) 9.4 MeV
(3) 804 MeV (4) 216 MeV

MP0481

35. A radioactive nucleus ${}^{A}_{Z}X$ undergoes spontaneous decay in the sequence

${}^{A}_{Z}X \rightarrow {}_{Z-1}B \rightarrow {}_{Z-3}C \rightarrow {}_{Z-2}D$, where Z is the atomic number of element X. The possible decay particles in the sequence are :

(1) α, β^-, β^+ (2) α, β^+, β^-
(3) β^+, α, β^- (4) β^-, α, β^+

MP0482

36. The half-life of a radioactive nuclide is 100 hours. The fraction of original activity that will remain after 150 hours would be :

(1) 1/2 (2) $\frac{1}{2\sqrt{2}}$
(3) $\frac{2}{3}$ (4) $\frac{2}{3\sqrt{2}}$

MP0483

NEET(UG) 2021 (Paper-2)

37. Half life of a radioactive substance is 5 min. The time between 20% and 80% decay will be

(1) 5 min (2) 10 min
(3) 15 min (4) 20 min

MP0495

NEET(UG) 2022

38. In the given nuclear reaction, the element X is:

${}^{22}_{11}Na \rightarrow X + e^+ + \nu$

(1) ${}^{23}_{10}Ne$ (2) ${}^{22}_{10}Ne$ (3) ${}^{22}_{12}Mg$ (4) ${}^{23}_{11}Na$

MP0496

39. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is:

(1) 4 : 5 (2) 5 : 4 (3) 25 : 16 (4) 1 : 1

MP0497

NEET(UG) 2022 (Overseas)

40. At some instant, the number of radioactive atoms in a sample is N_0 and after time 't' the number decreases to N. It is found that the graphical representation 'ln N' versus 't' along the y and x axes respectively is a straight line. Then the slope of this line is:

(1) $-\lambda$ (2) λ^{-1} (3) $-\lambda^{-1}$ (4) λ

MP0498

41. The fraction of the original number of radioactive atoms that disintegrates (decays) during the average life time of a radioactive substance will be :

(1) $\frac{1}{1+e}$ (2) $\frac{e-1}{e+1}$ (3) $\frac{e-1}{e}$ (4) $\frac{1}{e}$

MP0499

Re-NEET(UG) 2022

42. Let R_1 be the radius of the second stationary orbit and R_2 be the radius of the fourth stationary orbit of an electron in Bohr's model. The ratio $\frac{R_1}{R_2}$ is :

(1) 0.25 (2) 0.5
(3) 2 (4) 4

MP0500

43. At any instant, two elements X_1 and X_2 have same number of radioactive atoms. If the decay constant of X_1 and X_2 are $10\ \lambda$ and λ respectively. then the time when the ratio of their atoms becomes $\frac{1}{e}$ respectively will be :

(1) $\frac{1}{11\lambda}$ (2) $\frac{1}{9\lambda}$

(3) $\frac{1}{6\lambda}$ (4) $\frac{1}{5\lambda}$

MP0501

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**4**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**4**	**2**	**3**	**2**	**3**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**2**	**4**	**4**	**3**	**4**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	**4**	**2**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43		
Ans.	**3**	**2**	**1**	**4**	**3**	**2**	**2**	**2**	**2**	**1**	**3**	**2**	**2**		

EXERCISE-III (Analytical Questions)

Master Your Understanding

1. The amount of U^{235} to be fissioned, to operate 10 kW nuclear reactor is (Approximately)

(1) 1.2×10^{-5} g/s (2) 1.2×10^{-7} g/s
(3) 1.2×10^{-9} g/s (4) 1.2×10^{-13} g/s

MP0281

2. A source of energy of 100 W is producing energy by fission of 1 kg U^{235}. How long it can kept generation of energy :- (approx)

(1) 2.5×10^{4} yr (2) 10^{6} s
(3) 8.6×10^{7} s (4) 100 yr

MP0282

3. A nuclear fusion reaction is given below :

$_1H^2 + {_1H^2} \rightarrow {_2He^3} + n + 3.2$ MeV

How much energy will be generated when 2 kg of deuterons are fused :- (approx)

(1) 10^{30} eV (2) 5×10^{23} MeV
(3) 10^{22} MeV (4) 10^{33} eV

MP0283

4. Energy released by 1 kg. U^{235}, when it is fissoned

(1) 8×10^{10} KWH (2) 5×10^{30} eV
(3) 10^{10} Joule (4) 5×10^{26} MeV

MP0284

5. A γ ray photon produces an electron positron pair, If the rest mass energy of electron is 0.51 Mev and the total kinetic energy of electron-positron pair is 0.78 MeV then the energy of γ-ray photon in Mev is :-

(1) 0.78 (2) 1.8
(3) 1.28 (4) 0.28

MP0285

6. Binding energy of deuterium is 2.23 Mev, then its mass defect in a.m.u. is :-

(1) –0.0024 (2) –0.0012
(3) 0.0012 (4) 0.0024

MP0286

7. 200 MeV of energy can be obtained by per fission. In a reactor generating 1000 kW find the number of nuclei under going the fission per second :-

(1) 1000 (2) 2×10^{8}
(3) 3.125×10^{16} (4) 931

MP0287

8. The total energy of an electron is 3.555 MeV, then its Kinetic energy is :-

(1) 3.545 MeV (2) 3.045 MeV
(3) 3.5 MeV (4) None

MP0288

9. Radius of nucleus varies as $R = R_0(A)^{1/3}$, where R_0 = 1.3 fermi. What is the volume of Be^8 nucleus (approx) [A = atomic mass]

(1) 7×10^{-38} cc (2) 7×10^{-29} cc
(3) 7×10^{-45} cc (4) none of the above

MP0289

10. We are given the following atomic masses

^{238}U = 238.05079 u ^{234}Th = 234.04363 u
^{4}He = 4.00260 u

The energy released during the alpha decay of ^{238}U is :-

(1) 6.00 MeV (2) 4.25 MeV
(3) 3.75 MeV (4) 5.03 MeV

MP0290

11. Fission of one nucleus $_{92}U^{235}$ releases 250 MeV of energy. The number of fissions per second required to produce 1 MW power is

(1) 9.2×10^{17} (2) 6.3×10^{23}
(3) 1.6×10^{19} (4) 2.5×10^{16}

MP0291

12. A $_6C^{12}$ nucleus is to be divided into 3 alpha partricles. The amount of energy required to achieve this (mass of an alpha particle = 4.00388 u) is

(Mass of $_6C^{12}$ atom = 12.0000 u)

(1) 3. 405 MeV (2) 10.837 MeV
(3) 8.133 MeV (4) 12.573 MeV

MP0292

13. The radius of a spherical nucleus as measured by electron scattering is 3.6 fm. What is the likely mass number of the nucleus ?

(1) 27 (2) 40 (3) 56 (4) 120

MP0293

14. The binding energy of deuteron $\left({}_1^2\mathrm{H}\right)$ is 1.15 MeV per nucleon and an alpha particle has binding energy of 7.1 MeV per nucleon. Then in the reaction

$${}_1^2\mathrm{H} + {}_1^2\mathrm{H} \rightarrow {}_2^4\mathrm{He} + Q$$

the energy Q is

(1) 33. 0 MeV (2) 28.4 MeV
(3) 23.8 MeV (4) 4.6 MeV

MP0294

15. Consider the following reaction

${}_1^1\mathrm{H} + {}_1^3\mathrm{H} \rightarrow {}_1^2\mathrm{H} + {}_1^2\mathrm{H}$

The atomic masses are given as

$m\left({}_1^1\mathrm{H}\right) = 1.007825\ u$ $m\left({}_1^2\mathrm{H}\right) = 2.014102\ u$

$m\left({}_1^3\mathrm{H}\right) = 3.016049\ u$

The Q– value of the above reaction will be

(1) –4.03 MeV (2) –2.01 MeV
(3) 2.01 MeV (4) 4.03 MeV

MP0295

16. A nucleus of mass number 220, initially at rest, emits an α-particle. If the Q value of the reaction is 5.5 MeV, the energy of the emitted α-particle will be

(1) 4.8 MeV (2) 5.4 MeV
(3) 7.5 MeV (4) 6.8 MeV

MP0296

17. An open container has net 10 gm mass of a radioactive material. The net mass in the container after two mean lives is approximately:-

(1) 1.35 gm (2) 2.5 gm
(3) 10 gm (4) 5 gm

MP0297

18. A radioactive nucleus ${}_Z X^A$ emits 3α–particles and 5β–particles. The ratio of number of neutrons to that of protons in the product nucleus will be :–

MP0298

(1) $\frac{A-Z-12}{Z-6}$ (2) $\frac{A-Z}{Z-1}$

(3) $\frac{A-Z-11}{Z-6}$ (4) $\frac{A-Z-11}{Z-1}$

19. The activity of a radioactive sample is 9750 counts/min at t = 0 and 975 counts/min at t = 5 minute. The decay constant is approx:-

(1) 0.922 min^{-1} (2) 0.691 min^{-1}
(3) 0.461 min^{-1} (4) 0.230 min^{-1}

MP0299

20. Initial ratio of active nuclei in two different samples is 2:3. Their half lives are 2hr and 3hr respectively. Ratio of their activities at the end of 12hr is:-

(1) 1 : 6 (2) 6 : 1 (3) 1 : 4 (4) 4 : 1

MP0300

21. A radioactive sample disintegrates by 10% during one month. How much fraction will disintegrate in four months :-

(1) 34.39% (2) 40%
(3) 38% (4) 50%

MP0301

22. 7/8 fraction of a sample disintegrates in t time. How much time it will take to disintegrete 15/16 fraction :-

(1) t (2) $\frac{4}{3}t$ (3) $\frac{5}{3}t$ (4) 2t

MP0302

23. 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 :-

(1) 1080 (2) 2430
(3) 3240 (4) 4860

MP0303

24. If $N_t=N_0e^{-\lambda t}$ then number of disintegrated atoms between t_1 to t_2 ($t_2 > t_1$) will be :-

(1) $N_0[e^{\lambda t_2} - e^{\lambda t_1}]$

(2) $N_0[e^{-\lambda t_2} - e^{-\lambda t_1}]$

(3) $N_0[e^{-\lambda t_1} - e^{-\lambda t_2}]$

(4) None

MP0304

25. The half life of a radioactive material is T. After T/2 time, the material left is :-

(1) 1/2

(2) 3/4

(3) $\frac{1}{\sqrt{2}}$

(4) $\left(\sqrt{2}-1\right)/\sqrt{2}$

MP0305

26. The half life of a radioactive element is 30days, in 90days the percentage of disintegrated part is

(1) 13.5 %
(2) 46.5 %
(3) 87.5%
(4) 90.15%

MP0306

27. The half life of a radioactive element is 10 days. If the mass of the specimen reduces to $(1/10)^{th}$ then the time taken is.

(1) 100 days
(2) 50 days
(3) 33 days
(4) 16 days

MP0307

28. N atoms of a radioactive element emits n alpha particles per second. The half life of the element is :-

(1) n/N seconds

(2) N/n seconds

(3) 0.693 N/n seconds

(4) 0.693 n/N seconds

MP0308

29. 10 gram of radioactive material of half-life 15 years is kept in a box for 20 years. The disintegrated material is :

(1) 10.2 g
(2) 6.03 g
(3) 4.03 g
(4) 12.6 g

MP0309

30. The activity of a sample of a redioactive material is A_1 at time t_1 and A_2 at time t_2 ($t_2 > t_1$). If its mean life is T, then :

(1) $A_1t_1 = A_2t_2$
(2) $A_2 = A_1e^{(t_1-t_2)/T}$
(3) $A_1 - A_2 = t_2 - t_1$
(4) $A_2 = A_1e^{(t_1/t_2)T}$

MP0310

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

(1) 4.6×10^{12} atoms/s
(2) 2.3×10^{11} atoms/s
(3) 4.6×10^{10} atoms/s
(4) 2.3×10^{8} atoms/s

MP0311

32. There are two radio nuclei A and B. A is an alpha emitter and B is a beta emitter. Their disintegration constants are in the ratio of 1:2. What should be the ratio of number of atom of A and B at any time t so that probabilities of getting alpha and beta particles are same at that instant.

(1) 2 : 1
(2) 1 : 2
(3) e
(4) e^{-1}

MP0312

33. $^{238}_{92}U$ emits 8 α–particle and 6 β–particles. The neutron/proton ratio in the product nucleus is :-

(1) 60/41
(2) 61/40
(3) 62/41
(4) 61/42

MP0313

34. What is energy released in the β-decay of $^{32}P \rightarrow {}^{32}S$? (Given : atomic masses : 31.97391 u for ^{32}P and 31.97207 u for ^{32}S)

(1) – 1.2 MeV
(2) + 1.7 MeV
(3) + 2.1 MeV
(4) – 0.9 MeV

MP0314

35. The radioactive decay constant of $^{90}_{38}Sr$ is $7.88 \times 10^{-10}\ s^{-1}$. The activity of 15 mg of this isotope will be

(1) 1.5 Ci (2) 2.13 Ci

(3) 7.88 Ci (4) 8.76 Ci

MP0315

36. A radioactive substance emits n beta particles in the first 2 seconds and 0.5 n beta particles in the next 2 seconds. Then mean life of the sample is?

(1) 4 s (2) 2 s

(3) $\frac{2}{(\ln 2)}$ s (4) 2(ln2) s

MP0316

37. Two radioactive materials X_1 and X_2 decay constants 6λ and 3λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2 will be $\frac{1}{e}$ after a time

(1) $\frac{1}{6\lambda}$ (2) $\frac{1}{3\lambda}$

(3) $\frac{3}{6\lambda}$ (4) $\frac{6}{9\lambda}$

MP0317

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**1**	**4**	**4**	**2**	**4**	**3**	**2**	**1**	**2**	**4**	**2**	**1**	**3**	**1**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**3**	**4**	**3**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**3**	**2**	**2**
Que.	31	32	33	34	35	36	37								
Ans.	**4**	**1**	**3**	**2**	**2**	**3**	**2**								