GPLUS EDUCATION

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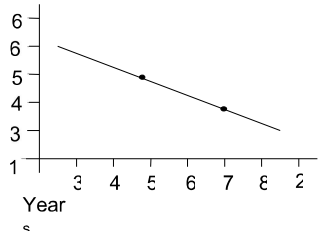
NUCLEI

Single Correct Answer Type

1. During the β − decay
   a) An atomic electron is ejected
   b) An electron, already present within the nucleus, is ejected.
   c) A proton in the nucleus decays emitting an electron
   d) A neutron in the nucleus decays emitting an electron
2. Which of the following particles are constituents of the nucleus
   a) Protons and electrons b) Protons and neutrons
   c) Neutrons and electrons d) Neutrons and positrons
3. A radioactive nucleus can decay simultaneously by two different processes which have decay constant λ_1 and λ_2.The effective decay constant of the nuclide is λ, where
   a) $\lambda = \lambda_1 + \lambda_2$ b) $\lambda = 2(\lambda_1 + \lambda)$ c) $\frac{1}{\lambda} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2}$ d) $\lambda = \sqrt{\lambda_1 \lambda_2}$
4. The element used for radioactive carbon dating for more than 56000 yr is
   a) C-14 b) U-234 c) U-238 d) Po-94
5. The half-life of Bi^{210} is 5 days. What time is taken by $(7/8)^{\text{th}}$ part of the sample to decay
   a) 3.4 days b) 10 days c) 15 days d) 64 days
6. In hydrogen atom, the electron is moving round the nucleus with velocity $2.18 \times 10^6 m/s$ in an orbit of radius 0.528Å. The acceleration of the electron is
   a) $9 \times 10^{18} m/s^2$ b) $9 \times 10^{22} m/s^2$ c) $9 \times 10^{-22} m/s^2$ d) $9 \times 10^{12} m/s^2$
7. The ratio of the wavelengths for $2 \rightarrow 1$ transition on Li^{++}, He^{+} and H is
   a) 1 : 2 : 3 b) 1 : 4 : 9 c) 4 : 9 : 36 d) 3 : 2 : 1
8. Which is the correct expression for half-life
   a) $(t)_{1/2} = \log 2$ b) $(t)_{1/2} = \frac{\lambda}{\log 2}$ c) $(t)_{1/2} = \frac{\lambda}{\log 2}(2.303)$ d) $(t)_{1/2} = \frac{2.303 \log 2}{\lambda}$
9. The radius of a nucleus with atomic mass number 7 is 2fermi. Find the radius of nucleus with atomic number 189.
   a) 3 fermi b) 4 fermi c) 5 fermi d) 6 fermi
10. A diatomic molecule is made of two masses m_1 and m_2 which are separated by a distance r. If we calculate its rotational energy by applying Bohr's rule of angular momentum quantization, its energy will be given by (n is an integer)
    a) $\frac{(m_1 + m_2)^2 n^2 h^2}{2m_1^2 m_2^2 r^2}$ b) $\frac{n^2 h^2}{2(m_1 + m_2) r^2}$ c) $\frac{2n^2 h^2}{(m_1 + m_2) r^2}$ d) $\frac{(m_1 + m_2)\, n^2 h^2}{2m_1 m_2 r^2}$
11. For thorium A=232,Z =90 at the end of some radioactive disintegration we obtain an isotope of lead with A =208 and Z =82, then the number of emitted αandβ particles are
    a) $\alpha = 4, \beta = 6$ b) $\alpha = 5, \beta = 5$ c) $\alpha = 6, \beta = 4$ d) $\alpha = 6, \beta = 6$
12. Energy of electron in an orbit of H-atom is
    a) Positive b) Negative c) Zero d) Nothing can be said
13. Consider an initially pure 3.4 g sample of ^{67}Ga, an isotope that has a half-life of 78 h. What is its initial decay rate?
    a) $8.00 \times 10^{16} s^{-1}$ b) $6.27 \times 10^{16} s^{-1}$ c) $7.53 \times 10^{16} s^{-1}$ d) $8.53 \times 10^{15} s^{-1}$

14. To determine the half- life of radioactive element, a student plots graph of $\ln\left|\frac{dN(t)}{dt}\right|$ *versus* t. Here $\frac{dN(t)}{dt}$ is the rate of radioactive decay at time t. If the number of radioactive nuclei of this element decreases by a factor of p after 4.16 yr, the value of p is



a) 8 b) 7 c) 4 d) 8.5

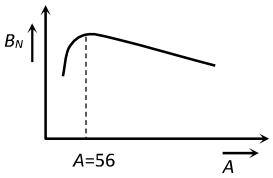
15. The radius of the first (lowest) orbit of the hydrogen atom is a_0. The radius of the second (next higher) orbit will be

a) $4a_0$ b) $6a_0$ c) $8a_0$ d) $10a_0$

16. 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) $\gamma > \alpha > \beta$

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

a)


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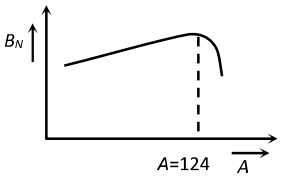

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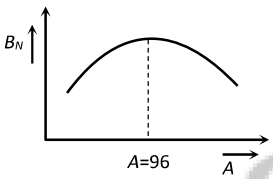
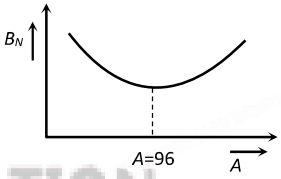


d)


18. Pick out the unmatched pair from the following

a) Moderator – Heavy water
b) Nuclear fuel - ${}_{92}U^{235}$
c) Pressurized water reactor – water as the heat exchange system
d) Safety rods – Carbon

19. A count rate metre shows a count of 240 per minute from a given radioactive source later the metre shows a count rate 0f 30 min^{-1}. The half-life of the source is

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

20. 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) $Z, A-2$

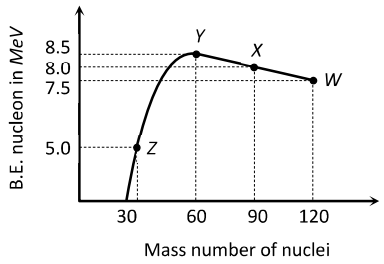
21. The nucleus ${}_{92}\text{U}^{234}$ splits exactly in half in a fission reaction in which two neutrons are released.The resultant nuclei are

a) ${}_{46}\text{Pd}^{116}$ b) ${}_{45}\text{Rh}^{117}$ c) ${}_{45}\text{Rh}^{116}$ d) ${}_{46}\text{Pd}^{117}$

22. 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 160 g of A_2. The amount of the two in the mixture will become equal after

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

23. Binding energy per nucleon verses mass number curve for nuclei is shown in the figure. W, X, Y and Z are four nuclei indicated on the curve. The process that would release energy is



a) $Y \rightarrow 2Z$ b) $W \rightarrow X + Z$ c) $W \rightarrow 2Y$ d) $X \rightarrow Y + Z$

24. The number of neutrons released when ${}_{92}U^{235}$ undergoes fission by absorbing ${}_{0}n^{1}$ and (${}_{56}Ba^{144} + {}_{36}Kr^{89}$) are formed is
a) 0 b) 1 c) 2 d) 3

25. Which of the following isotopes is normally fissionable
a) ${}_{92}U^{238}$ b) ${}_{93}Np^{239}$ c) ${}_{92}U^{235}$ d) ${}_{2}He^{4}$

26. Which of the following is true for a sample of isotope containing U^{235} and U^{238}
a) Number of neutrons are same in both
b) Number of protons, electrons and neutrons 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 neutrons than U^{235}

27. When the wave of hydrogen atom comes from infinity into the first orbit then the value of wave number is
a) 109700 cm^{-1} b) 1097 cm^{-1} c) 109 cm^{-1} d) None of these

28. 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
a) $5 \log_e 2$ b) $\log_e 2/5$ c) $\frac{5}{\log_e 2}$ d) $5 \log_{10} 2$

29. Half-life of radioactive substance is 3.20 h. What is the time taken for a 75% of substance to be used?
a) 6.38 h b) 12 h c) 4.18 day d) 1.2 day

30. 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 1:16 in a sample of a given rock. The age of the rock was estimated to be
a) 100 years b) 150 years c) 200 years d) 250 years

31. The mass defect per nucleon is called
a) Binding energy b) Packing fraction c) Ionization energy d) Excitation energy

32. The wavelength of the first line of Lyman series for hydrogen atom is equal to that of the second line of Balmer series for a hydrogen like ion. The atomic number Z of hydrogen like ion is
a) 2 b) 3 c) 4 d) 1

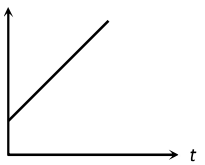
33. In which of the following decay, the element does not change
a) β-decay b) α-decay c) γ-decay d) None of these

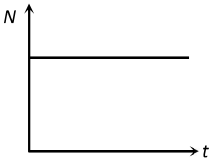
34. The decay constant of radium is $4.28 \times 10^{-4} per\ year$. Its half life will be
a) 2000 $years$ b) 1240 $years$ c) 63 $years$ d) 1620 $years$

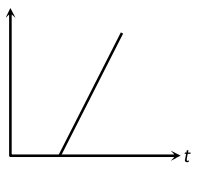
35. Nuclear fission can be explained based on
a) Millikan's oil drop method b) Liquid drop model
c) Shell model d) Bohr's model

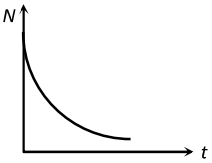
36. In hydrogen atom, when electron jumps from second to first orbit, then energy emitted is
a) $-13.6\ eV$ b) $-27.2\ eV$ c) $-6.8\ eV$ d) None of these

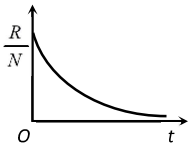
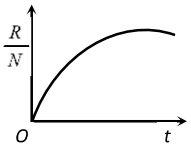
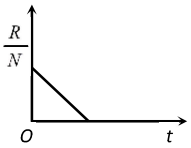
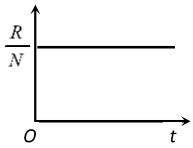
37. The volume of a nucleus is directly proportional to
a) A b) A^3
c) $\sqrt{A}$ d) $A^{1/3}$ (where A=mass number of the nucleus)

38. In the nuclear reaction: $X(n,\alpha)\ {}_3Li^7$ the term X will be
    a) ${}_5B^{10}$ b) ${}_5B^{9}$ c) ${}_5B^{11}$ d) ${}_2He^{4}$
39. Solar energy is mainly cause 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
40. The ratio of minimum to maximum wavelength in Balmer series is
    a) 5 : 9 b) 5 : 36 c) 1 : 4 d) 3 : 4
41. $\mathbf{F}_{pe}$ represents electrical force on proton due to electron and $\mathbf{F}_{ep}$on electron due to proton in a hydrogen atom.Similarly $\mathbf{F}_{pe}$ represents the gravitational force on proton due to electron and $\mathbf{F}_{ep}$ the corresponding force on electron due to proton. Which of the following is not true?
    a) $\mathbf{F}_{Pe} + \mathbf{F}_{ep} = 0$ b) $\mathbf{F'}_{Pe} + \mathbf{F'}_{ep} = 0$
    c) $\mathbf{F}_{Pe} + \mathbf{F'}_{Pe} + \mathbf{F}_{ep} + \mathbf{F'}_{ep} = 0$ d) $\mathbf{F}_{Pe} + \mathbf{F'}_{Pe} = 0$
42. A hydrogen like atom of atomic number Z is in an excited state of quantum number $2n$. It can emit a maximum energy photon of 204 eV. If it makes a transition to quantum state n, a photon of energy 40.8 eV is emitted. The value of n will be
    a) 1 b) 2 c) 3 d) 4
43. 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
44. Half life of a radioactive element is 10 days. The time during which quantity remains 1/10 of initial mass will be
    a) 100 days b) 50 days c) 33 days d) 16 days
45. The power obtained in a reactor using U^{235} disintegration is 1000 kW. The mass decay of U^{235} per hour is
    a) 1 microgram b) 10 microgram c) 20 microgram d) 40 microgram
46. What is the ground state energy of positronium
    a) 13.6 eV b) 27.2 eV c) 5.4 eV d) 1.8 eV
47. In beta decay
    a) The parent and daughter nuclei have same number of protons
    b) The daughter nucleus has one proton less than the parent nucleus
    c) The daughter nucleus has one proton more than the parent nucleus
    d) The daughter nucleus has one neutron more than the parent nucleus
48. The half-life for the α-decay of uranium ${}_{92}U^{238}$is 4.47×10^9 yr. If a rock contains sixty percent of its original ${}_{92}U^{238}$atoms, its age is [$\log 6 = 0.778;\ \log 2 = 0.3$]
    a) 3.3×10^9yr b) 6.6×10^9yr c) 1.2×10^8yr d) 5.4×10^7yr
49. The extreme wavelengths of Paschen series are
    a) 0.365μm and 0.565μm b) 0.818μm and 1.89μm
    c) 1.45μm and 0.04μm d) 2.27μm and 7.43μm
50. If a radioactive substance reduces to $\frac{1}{16}$ of its original mass in 40 $days$, what is its half life
    a) 10 $days$ b) 20 $days$ c) 40 $days$ d) None of these
51. The graph between the instantaneous concentration (N) of a radioactive element and time (t) is
    a) 

    b) 

    c) 

    d) 

52. 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) Behavior of λ with time depends on the nature of the activity
53. The nuclear radius of a certain nucleus is 7.2 fm and it has charge of 1.28×10^{-17} C. The number of neutrons inside the nucleus is
    a) 136 b) 142 c) 140 d) 132
54. A radioactive sample has N_0 active atoms $t = 0$. 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) 
55. 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) $\frac{\sqrt{2}-1}{\sqrt{2}}$
56. The half-life of radioactive Radon is 3.8 days. The time at the end of which (1/20)th of the Radon sample will remain undecayed is (given $\log_{10} e = 0.4343$)
    a) 13.8 days b) 16.5 days c) 33 days d) 76 days
57. 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) ${}^{115}_{50}Sn$
58. In the following reaction
    ${}_{12}Mg^{24} + {}_{2}He^{4} \rightarrow {}_{14}Si^{X} + {}_{0}n^{1}, X$ is
    a) 28 b) 27 c) 26 d) 22
59. 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 is T, then
    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) $A_2 = A_1 e^{(t_1/t_2)/T}$
60. A deutron is bombarded on ${}_{8}O^{16}$ nucleus and α-particle is emitted. The product nucleus is
    a) ${}_{7}N^{13}$ b) ${}_{5}B^{10}$ c) ${}_{4}Bc^{9}$ d) ${}_{7}N^{14}$
61. Which of the following radiations has the least wavelength
    a) X-rays b) γ-rays c) β-rays d) α-rays
62. Rutherford's α-particle experiment showed that the atoms have
    a) Proton b) Nucleus c) Neutron d) Electrons
63. A$^{238}_{92}$U nucleus at rest is decayed by emitting alpha particle into$^{234}_{90}$Th. The speeds of the alpha particle and the thorium nucleus are in the ratio.
    a) 3:58 b) 58:3 c) 1:58 d) 58:1
64. Whenever a hydrogen atom emits a photon in the Balmer series
    a) It may not emit any more photons
    b) It may emit another photon in the Paschen series
    c) It must emit another photon in the Lyman series
    d) It may emit another photon in the Balmer series
65. The end product of the decay of ${}_{90}\text{Th}^{232}$ is ${}_{82}\text{Pb}^{208}$. The number of α and β-particles emitted are respectively
    a) 6,4 b) 3,3 c) 4,6 d) 6,0
66. A nucleus disintegrates into two nuclear parts which have their velocities in the ratio 2:1. The ratio of their nuclear sizes will be
    a) $2^{1/3}:1$ b) $1:3^{1/2}$ c) $3^{1/2}:1$ d) $1:2^{1/3}$

67. The ratio of the energies of the hydrogen atom in its first to second excited state is
a) $1/4$ b) $4/9$ c) $9/4$ d) 4

68. Radio carbon dating is done by estimating in specimen the
a) Amount of ordinary carbon still present b) Amount of radio carbon still present
c) Ratio of amount of $^{14}C_6$ to $^{12}C_6$ still present d) Ratio of amount of $^{12}C_6$ to $^{14}C_6$ still present

69. A heavy nucleus at rest breaks into two fragments which fly off with velocities in the ratio 8:1. The ratio of radii of the fragments is
a) 1 : 2 b) 1 : 4 c) 4 : 1 d) 2 : 1

70. 16 g sample of a radioactive element is taken from Bombay to Delhi in 2 $hour$ and it was found that 1 g of the element remained (undisintegrated). Half life of the element is
a) 2 $hour$ b) 1 $hour$ c) $1/2$ $hour$ d) $1/4$ $hour$

71. If the distance between nuclei is 2×10^{-13}cm, the density of nuclear material is
a) $3.21 \times 10^{-12}\text{kgm}^{-3}$ b) $1.6 \times 10^{-3}\text{kgm}^{-3}$
c) $2 \times 10^{9}\text{kgm}^{-3}$ d) $4 \times 10^{17}\text{kgm}^{-3}$

72. The wavelength of the first spectral line in the Balmer series of hydrogen atom is 6561 Å. The wavelength of the second spectral line in the Balmer series of singly ionized helium atom is
a) 1215 Å b) 1640 Å c) 2430 Å d) 4687 Å

73. Which of the following is suitable for the fusion process
a) Heavy nuclei b) Light nuclei c) Atom bomb d) Radioactive decay

74. An observer A sees an asteroid with a radioactive element moving by at a speed $= 0.3\ c$ and measures the radioactivity decay time to be T_A. Another observer B is moving with the asteroid and measures its decay time as T_B. Then T_A and T_B are related as below
a) $T_B < T_A$
b) $T_B = T_A$
c) $T_B > T_A$
d) Either (a) or (c) depending on whether the asteroid is approaching or moving away from A

75. The ratio between Bohr radii are
a) 1 : 2 : 3 b) 2 : 4 : 6 c) 1 : 4 : 9 d) 1 : 3 : 5

76. 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

77. An electron has a mass of $9.1 \times 10^{-31}kg$. It revolves around the nucleus in a circular orbit of radius $0.529 \times 10^{-10}metre$ at a speed of $2.2 \times 10^{6}m/s$. The magnitude of its linear momentum in this motion is
a) $1.1 \times 10^{-34}kg - m/s$ b) $2.0 \times 10^{-24}kg - m/s$ c) $4.0 \times 10^{-24}kg - m/s$ d) $4.0 \times 10^{-31}kg - m/s$

78. 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 ∞

79. The possible quantum numbers for $3d$ electrons are
a) $n = 3, l = 1, m_l = +1, m_s = -\frac{1}{2}$ b) $n = 3, l = 2, m_l = +2, m_s = -\frac{1}{2}$
c) $n = 3, l = 1, m_l = -1, m_s = +\frac{1}{2}$ d) $n = 3, l = 0, m_l = +1, m_s = -\frac{1}{2}$

80. Hydrogen atom emits blue light when it changes from $n = 4$ energy level to the $n = 2$ level. Which colour of light would the atom emit when it changes from the $n = 5$ level to the $n = 2$ level
a) Red b) Yellow c) Green d) Violet

81. Neutron decay in free space is given as follows
$_0n^1 \rightarrow {}_1\text{H}^1 + -_1e^0 + [\,]$ Then the parenthesis represents a
a) Neutrino b) Photon c) Antineutrino d) Graviton

82. During a nuclear fusion reaction

a) A heavy nucleus breaks into two fragments by itself
b) A light nucleus bombarded by thermal neutrons break up
c) A heavy nucleus bombarded by thermal neutrons break up
d) Two light nuceli combine to give a heavier nucleus and possible other products

83. How many neutrons are more than protons in ${}_{92}U^{235}$ nucleus?
a) 54 b) 49 c) 51 d) 143

84. The ratio of the longest to shortest wavelengths in Brackett series of hydrogen spectra is
a) $\frac{25}{9}$ b) $\frac{17}{6}$ c) $\frac{9}{5}$ d) $\frac{4}{3}$

85. The ratio of the frequencies of the long wavelength limits of Lyman and Balmer series of hydrogen spectrum is
a) 27 : 5 b) 5 : 27 c) 4 : 1 d) 1 : 4

86. The energy of a hydrogen atom in the ground state is $-13.6\ eV$. The energy of a He^+ ion in the first excited state will be
a) $-6.8\ eV$ b) $-13.6\ eV$ c) $-27.2\ eV$ d) $-54.4\ eV$

87. If ${}_{92}U^{238}$ emits 8 α −particles and 6 β −particles, then the resulting nucleus is
a) ${}_{82}U^{206}$ b) ${}_{82}Pb^{206}$ c) ${}_{82}U^{210}$ d) ${}_{82}U^{214}$

88. If R is the Rydberg's constant for hydrogen the wave number of the first line in the Lyman series will be
a) $\frac{R}{4}$ b) $\frac{3R}{4}$ c) $\frac{R}{2}$ d) $2R$

89. A radioactive decay chain starts from ${}_{92}Np^{237}$ produces ${}_{90}Th^{229}$ by successive emissions. The emitted particles can be
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

90. Consider a radioactive material of half-life 1.0 $minute$. If one of the nuclei decays now, the next one will decay
a) After 1 $minute$
b) After $\frac{1}{\log_e 2} minute$
c) After $\frac{1}{N} minute$, where N is the number of nuclei present at that moment
d) After any time

91. A nucleus of mass 214 amu in free state decays to emit an α-particle. Kinetic energy of the α-particle emitted is 6.7 MeV. The recoil energy (in MeV) of the daughter nucleus is
a) 1.0 b) 0.5 c) 0.25 d) 0.125

92. It is easier to ionize hydrogen as compared to deuterium, because
a) Hydrogen is lighter than deuterium
b) Atomic number of hydrogen is lesser than deuterium
c) Hydrogen is a diatomic gas
d) The statements is wrong

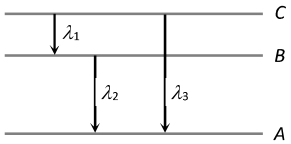
93. The nucleus ${}_6C^{12}$ absorbs an energetic neutron and emits a beta particle (β). The resulting nucleus is
a) ${}_7N^{14}$ b) ${}_5B^{13}$ c) ${}_7N^{13}$ d) ${}_6C^{13}$

94. Energy of an electron in n^{th} orbit of hydrogen atom is $\left(k = \frac{1}{4\pi\varepsilon_0}\right)$
a) $-\frac{2\pi^2k^2me^4}{n^2h^2}$ b) $-\frac{4\pi^2mke^2}{n^2h^2}$ c) $-\frac{n^2h^2}{2\pi\ k\ me^4}$ d) $-\frac{n^2h^2}{4\pi^2k\ me^2}$

95. In a radioactive decay. The half-life of radioactive substance is $T_{1/2} = 69.3s$. The decay constant is
a) 1.5 s^{-1} b) 2.21 s^{-1} c) 0.01 s^{-1} d) 3.01 s^{-1}

96. Three fourth of the active decays in a radioactive sample in $\frac{3}{4}s$. The half life of the sample is
a) $\frac{1}{2}s$ b) $1s$ c) $\frac{3}{8}s$ d) $\frac{3}{4}s$

97. Energy levels A, B, C of a certain atom corresponding to increasing values of energy, $i.e., E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelength of radiations corresponding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct



a) $\lambda_3 = \lambda_1 + \lambda_2$ b) $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$ c) $\lambda_1 + \lambda_2 + \lambda_3 = 0$ d) $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

98. Half-life of radio-active substance is 140 days. Initially, is 16 g. Calculate the time for this substance when it reduces to 1 g
a) 140 days b) 280 days c) 420 days d) 560 days

99. An electron with kinetic energy 5 eV is incident on a H-atom in its ground state. The collision
a) Must be elastic
b) May be partially elastic
c) Must be completely elastic
d) May be completely inelastic

100. If scattering particles are 56 for 90° angle, then at an angle 60° it will be
a) 224 b) 256 c) 98 d) 108

101. A nuclear transformation is denoted by $X\ (n,\alpha) \rightarrow {}^{7}_{3}\text{Li}$. Which of the following is the nucleus of element X?
a) ${}^{12}_{6}\text{C}$ b) ${}^{10}_{5}\text{B}$ c) ${}^{9}_{5}\text{B}$ d) ${}^{11}_{4}\text{Be}$

102. When a ${}_4Be^9$ atom is bombarded with α −particles, one of the products of nuclear transmutation is ${}_6C^{12}$. The other is
a) ${}_{-1}e^0$ b) ${}_1H^1$ c) ${}_1D^2$ d) ${}_0n^1$

103. What will be the angular momentum of an electron, if energy of this electron in H-atom is $-1.5eV$ (in J-s)
a) 1.05×10^{-34} b) 2.1×10^{-34} c) 3.15×10^{-34} d) -2.1×10^{-34}

104. Some radioactive nucleus may emit
a) Only one α, β or γ at a time
b) All the three α, β and γ one after another
c) All the three α, β and γ simultaneously
d) Only α and β simultaneously

105. 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
a) Isobar of parent b) Isomer of parent c) Isotone of parent d) Isotope of parent

106. 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

107. 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

108. Mass spectrometric analysis of potassium and argon atoms in a Moon rock sample shows that the ratio of the number of (stable) ${}^{40}\text{Ar}$ atoms present to the number of (radioactive) ${}^{40}\text{K}$ atoms is 10.3. Assume that all the argon atoms were produced by the decay of potassium atoms, with a half-life of 1.25×10^9 yr. How old is the rock?
a) 2.95×10^{11}yr b) 2.95×10^{9}yr c) 437×10^{9}yr d) 437×10^{11}yr

109. The number of revolutions per second made by an electron in the first Bohr orbit of hydrogen atom is of the order of
a) 10^{20} b) 10^{19} c) 10^{17} d) 10^{15}

110. As mass number increases ,surface area
a) Decreases
b) Increases
c) Remains the same
d) Remains the same and Increases

111. 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

112. A radioactive nucleus of mass M emits a photon of frequency v and the nucleus recoils. The recoil energy will be
a) hv b) $Mc^2 - hv$ c) $\frac{h^2v^2}{2Mc^2}$ d) Zero

113. The S.I. unit of radioactivity is
a) Roentgen b) Rutherford c) Curie d) Becquerel

114. When a proton, anti-proton annihilate ,the energy released is
a) 1.5×10^{-10} J b) 28.8×10^{-10} J c) 6×10^{-10} J d) $9 \times 10 - 10$ J

115. The nuclide ^{131}I is radioactive, with a half-life of 8.04 days. At noon on January 1, the activity of a certain sample is 600 Bq. The activity at noon on January 24 will be
a) 75 Bq b) Less than 75 Bq c) More than 75 Bq d) 150 Bq

116. A radioactive material has an initial amount $16g$. After 120 $days$ it reduces to $1g$, then the half-life of radioactive material is
a) 60 $days$ b) 30 $days$ c) 40 $days$ d) 240 $days$

117. The binding energy per nucleon of O^{16} is $7.97MeV$ 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

118. Starting with a sample of pure ^{66}Cu, 7/8 of it decays into Zn in 15 min. The corresponding half-life is
a) 10 min b) 15 min c) 5 min d) $7\frac{1}{2}$ min

119. What is the ratio of wavelength of radiations emitted when an electron in hydrogen atom jumps from fourth orbit to second orbit and from third orbit to second orbit
a) 27 : 25 b) 20 : 27 c) 20 : 25 d) 25 : 27

120. On bombarding U^{235} by slow neutrons, 200MeV energy is released. If the power output of atomic reactor is 1.6 MW, then the rate of fission will be
a) 5×10^{22} s^{-1} b) 5×10^{16}s^{-1} c) 8×10^{16} s^{-1} d) 20×10^{16} s^{-1}

121. In a hypothetical Bohr hydrogen, the mass of the electron is doubled. The energy E_0 and the radius r_0 of the first orbit will be (a_0 is the Bohr radius)
a) $E_0 = -27.2\ eV; r_0 = a_0/2$ b) $E_0 = -27.2\ eV; r_0 = a_0$
c) $E_0 = -13.6\ eV; r_0 = a_0/2$ d) $E_0 = -13.6\ eV; r_0 = a_0$

122. From a newly formed radioactive substance (Half life 2 $hours$), the intensity of radiation is 64 times the permissible safe level. The minimum time after which work can be done safely from this source is
a) 6 $hours$ b) 12 $hours$ c) 24 $hours$ d) 128 $hours$

123. A nucleus $_nX^m$ emits one α and one β-particle. The resulting nucleus is
a) $_nX^{m-4}$ b) $_{n-2}X^{m-4}$ c) $_{n-4}Z^{m-4}$ d) $_{n-1}Z^{m-4}$

124. In the reaction $^2_1H + ^3_1H \rightarrow ^4_2He + ^1_0n$ if the binding energies of ^2_1H, ^3_1H and ^4_2He are respectively a, b and c (in MeV), then the energy (in MeV) released in this reaction is
a) $c + a - b$ b) $c - a - b$ c) $a + b + c$ d) $a + b - c$

125. According to classical theory, the circular path of an electron in Rutherford atom is
a) Spiral b) Circular c) Parabolic d) Straight line

126. A radioactive substance contains 10000 nuclei and its half-life period is 20 days. The number of nuclei present at the end of 10 days is
a) 7070 b) 9000 c) 8000 d) 7500

127. Two energy levels of an electron in an atom are separated by 2.3 eV. The frequency of radiation emitted when the electrons goes from higher to the lower level is
a) $6.95 \times 10^{14} Hz$ b) $3.68 \times 10^{15} Hz$ c) $5.6 \times 10^{14} Hz$ d) $9.11 \times 10^{15} Hz$

128. The energy of the highest energy photon of Balmer series of hydrogen spectrum is close to
a) 13.6 eV b) 3.4 eV c) 1.5 eV d) 0.85 eV

129. A hydrogen atom emits a photon corresponding to an electron transition from $n = 5$ to $n = 1$. The recoil speed of hydrogen atom is almost (mass of proton $= 1.6 \times 10^{-27} kg$)
a) $10\ ms^{-1}$ b) $2 \times 10^{-2}\ ms^{-1}$ c) $4\ ms^{-1}$ d) $8 \times 10^{2}\ ms^{-1}$

130. Nuclear forces are
a) Short ranged attractive and charge independent
b) Short ranged attractive and charge dependent
c) Long ranged repulsive and charge independent
d) Long ranged repulsive and charge dependent

131. Half life of a radio-active substance is 20 $minutes$. The time between 20% and 80% decay will be
a) 20 $minutes$ b) 40 $minutes$ c) 30 $minutes$ d) 25 $minutes$

132. Two samples X and Y contain equal amount of radioactive substances. If $\frac{1}{16}$ th of the sample X and $\frac{1}{256}$ th of the sample Y, remain after 8 hours, then the ratio of half periods of X and Y is
a) 2 : 1 b) 1 : 2 c) 1 : 4 d) 1 : 16

133. Number of spectral lines in hydrogen atom is
a) 3 b) 6 c) 15 d) Infinite

134. In gamma ray emission from a nucleus
a) Both the neutron number and the proton number change
b) There is no change in the proton number and the neutron number
c) Only the neutron number changes
d) Only the proton number changes

135. Nuclear fusion is common to the pair
a) Thermonuclear reactor, uranium based nuclear reactor
b) Energy production in sun, uranium based nuclear reactor
c) Energy production in sun, hydrogen bomb
d) Disintegration of heavy nuclei, hydrogen bomb

136. The colour of the second line of Balmer series is
a) Blue b) Yellow c) Red d) Violet

137. In the Bohr model of a hydrogen atom, the centripetal force is furnished by the coulomb attraction between the proton and the electron. If a_0 is the radius of the ground state orbit, m is the mass, e is the charge on the electron and ε_0 is the vacuum permittivity, the speed of the electron is
a) 0 b) $\frac{e}{\sqrt{\varepsilon_0 a_0 m}}$ c) $\frac{e}{\sqrt{4\pi\varepsilon_0 a_0 m}}$ d) $\frac{\sqrt{4\pi\varepsilon_0 a_0 m}}{e}$

138. The mass defect in a particular nuclear reaction is 0.3 $grams$. The amount of energy liberated in kilowatt hours is
(Velocity of light $= 3 \times 10^{8} m/s$)
a) 1.5×10^{6} b) 2.5×10^{6} c) 3×10^{6} d) 7.5×10^{6}

139. The nuclei of which of the following pairs of nuclei are isotones
a) ${}_{34}Se^{74}$, ${}_{31}Ca^{71}$ b) ${}_{42}Mo^{92}$, ${}_{40}Zr^{92}$ c) ${}_{38}Sr^{81}$, ${}_{38}Sr^{86}$ d) ${}_{20}Ca^{40}$, ${}_{16}S^{32}$

140. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statements is true
a) Its kinetic energy increases and its potential and total energies decrease
b) Its kinetic energy decreases, potential energy increases and its total energy remains the same
c) Its kinetic and total energies decrease and its potential energy increases
d) Its kinetic, potential and total energies decrease

141. 1 curie represents
a) 1 disintegration per second b) 10^{6} disintegration per second
c) 3.7×10^{10} disintegration per second d) 3.7×10^{7} disintegration per second

142. 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

143. In the reaction
$_7N^{14} + \alpha \rightarrow {}_8X^{17} + {}_1p^1$
identify X.
a) O_2 b) N_2 c) He d) Ar

144. The velocity of an electron in the second orbit of sodium atom (atomic number = 11) is v. The velocity of an electron in its fifth orbit will be
a) v b) $\frac{22}{5}v$ c) $\frac{5}{2}v$ d) $\frac{2}{5}v$

145. An element A decays into element C by a two step process
$A \rightarrow B + {}_2He^4$
$B \rightarrow C + 2_{-1}e^0$
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

146. 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) $m \propto V^2$

147. If one starts with one curie of radioactive substance ($T_{1/2} = 12hrs$) the activity left after a period of 1 week will be about
a) 1 curie b) 120 micro curie c) 60 micro curie d) 8 mili curie

148. Minimum energy required to takeout the only one electron from ground state of He^+ is
a) 13.6 eV b) 54.4 eV c) 27.2 eV d) 6.8 eV

149. 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

150. Neutron is a particle, which is
a) Charged and has spin
b) Charged and has no spin
c) Charge less and has spin
d) Charge less and has no spin

151. Energy of $1g$ uranium is equal to
a) $9.0 \times 10^{13} J$ b) $9.0 \times 10^{19} J$ c) $3.0 \times 10^{16} J$ d) $3.0 \times 10^{17} J$

152. The shortest wavelength in the Lyman series of hydrogen spectrum is 912Å corresponding to a photon energy of 13.6 eV. The shortest wavelength in the Balmer series is about
a) 3648 Å b) 8208 Å c) 1228 Å d) 6566 Å

153. Which of the following is not conserved in nuclear reaction?
a) Total energy
b) Mass number
c) Charge number
d) Number of fundamental particles

154. In any Bohr orbit of the hydrogen atom, the ratio of kinetic energy to potential energy of the electron is
a) 1/2 b) 2 c) $-1/2$ d) -2

155. F_{pp}, F_{nn} and F_{np} are the nuclear forces between proton-proton, neutron-neutron and neutron-proton respectively. Then relation between them is
a) $F_{pp} = F_{nn} \neq F_{np}$ b) $F_{pp} \neq F_{nn} = F_{np}$ c) $F_{pp} = F_{nn} = F_{np}$ d) $F_{pp} \neq F_{nn} \neq F_{np}$

156. The half life period of a radioactive substance is 5 min. The amount of substance decayed in 20 min will be
a) 93.75% b) 75% c) 25% d) 6.25%

157. The radius of electron's second stationary orbit in Bohr's atom is R. The radius of the third orbit will be
a) 3 R b) 2.25 R c) 9 R d) $\frac{R}{3}$

158. An alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then the distance of closest approach for the alpha nucleus will be proportional to
a) $1/m$ b) $1/v^4$ c) $1/Ze$ d) v^2

159. 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

160. Which of the following statements is true
   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) $_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + {}_{2}He^{4}$

161. The minimum energy required to excite a hydrogen atom from its ground state is
   a) 13.6 *eV* b) -13.6 *eV* c) 3.4 *eV* d) 10.2 *eV*

162. Which of the following phenomena suggests the presence of electron energy levels in atoms
   a) Radio active decay b) Isotopes c) Spectral lines d) α-particles scattering

163. If the radius of a nucleus of mass number 3 is R, then the radius of a nucleus of mass number 81 is
   a) $3R$ b) $9R$ c) $(27)^{1/2}R$ d) $27R$

164. Which one of the following nuclear reaction is a source of energy in the sun?
   a) $_{4}\mathrm{Be}^{9} + {}_{2}\mathrm{He}^{4} \rightarrow {}_{6}\mathrm{C}^{12} + {}_{0}n^{1}$
   b) $_{2}\mathrm{He}^{3} + {}_{2}\mathrm{He}^{3} \rightarrow {}_{2}\mathrm{He}^{4} + {}_{1}\mathrm{H}^{1} + {}_{1}\mathrm{H}^{1}$
   c) $_{56}\mathrm{Ba}^{144} + {}_{36}\mathrm{Kr}^{92} \rightarrow {}_{92}\mathrm{U}^{235} + {}_{0}n^{1}$
   d) $_{26}\mathrm{Fe}^{50} + {}_{48}\mathrm{Ca}^{112} \rightarrow \mathrm{W}^{161} + {}_{0}n^{1}$

165. The fact that photons carry energy was established by
   a) Doppler's effect b) Compton's effect c) Bohr's theory d) Diffraction of light

166. Carbon dating is best suited for determining the age of fossils of their age in years is of the order of
   a) 10^3 b) 10^4 c) 10^5 d) 10^6

167. The energy equivalent to 1 mg of matter in MeV is
   a) 56.25×10^{22} b) 56.25×10^{24} c) 56.25×10^{26} d) 56.25×10^{28}

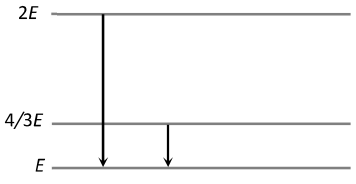
168. White light is passed through a dilute solution of potassium permanganate. The spectrum produced by the emergent light is
   a) Band emission spectrum
   b) Line emission spectrum
   c) Band absorption spectrum
   d) Line absorption spectrum

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

170. The energy of an electron in nth orbit of hydrogen atom is $-13.6/n^2$eV. Energy required to excite the electron from the first orbit to the third orbit is
   a) 10.2 J b) 12.09 J c) 12.09 eV d) 13.6 eV

171. In terms of Rydberg's constant R, the wave number of the first Balmer line is
   a) R b) $3R$ c) $\frac{5R}{36}$ d) $\frac{8R}{9}$

172. The following diagram indicates the energy levels of a certain atom when the system moves from $2E$ level to E, emitting a photon of wavelength λ. The wavelength of photon produced during its transition from $\frac{4E}{3}$ level to E is



   a) $\lambda/3$ b) $3\lambda/4$ c) $4\lambda/3$ d) 3λ

173. In the reaction identify X
   $_{7}N^{14} + \alpha \rightarrow {}_{8}X^{17} + {}_{1}p^{1}$
   a) An oxygen nucleus with mass 17
   b) An oxygen nucleus with mass 16
   c) A nitrogen nucleus with mass 17
   d) A nitrogen nucleus with mass 16

174. The half-life of ^{215}At is 100 μs. The time taken for the radioactivity of a sample of ^{215}At to decay to $\frac{1}{16}$ th of its initial value is
   a) 400 μs b) 6.3 μs c) 40 μs d) 300 μs

175. When $_{88}\mathrm{Ra}^{236}$ decays in a series by emission of 3α-particles and one β-particle, isotope X formed is
   a) $_{83}X^{224}$ b) $_{84}X^{218}$ c) $_{84}X^{220}$ d) $_{82}X^{223}$

176. The wavelength of the first line of Balmer series is 6563 Å. The Rydberg constant for hydrogen is about
a) $1.09 \times 10^{7} per\ m$ b) $1.09 \times 10^{8} per\ m$ c) $1.09 \times 10^{9} per\ m$ d) $1.09 \times 10^{5} per\ m$

177. The absorption transitions between the first and the fourth energy states of hydrogen atom are 3. The emission transitions between these states will be
a) 3 b) 4 c) 5 d) 6

178. The fussion process is possible at high temperatures, because at higher temperatures
a) The nucleus disintegrates
b) The molecules disintegrates
c) Atom become ionized
d) The nucleus get sufficient energy to overcome the strong forces of repulsion

179. An electron jumps from 5th orbit of 4th orbit of hydrogen atom. Taking the Rydberg constant as $10^{7} per\ metre$ what will be the frequency of radiation emitted
a) $6.75 \times 10^{12} Hz$ b) $6.75 \times 10^{14} Hz$ c) $6.75 \times 10^{13} Hz$ d) None of these

180. In a radioactive disintegration , the ratio of initial number of atoms to the number of atoms present at an instant of time equal to its mean life is
a) $\frac{1}{e^2}$ b) $\frac{1}{e}$ c) e d) e^2

181. The half life period of a radioactive element X is same as the mean life time of another radioactive element Y. Initially both 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

182. On the bombardment of neutron with Boron. α-particle is emitted and product nuclei formed is
a) ${}_{6}C^{12}$ b) ${}_{3}Li^{6}$ c) ${}_{3}Li^{7}$ d) ${}_{4}Be^{9}$

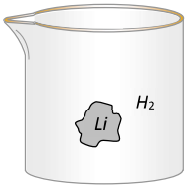
183. Cadmium rods are used in a nuclear reactor for
a) Slowing down fast neutrons b) Speeding up slow neutrons
c) Absorbing neutrons d) Regulating the power level of reactor.

184. Which shows radioactivity?
a) Protium b) Deuterium c) Tritium d) None of these

185. A nucleus of an element ${}_{84}X^{202}$ emits an α-particle first, a β-particle next and then a gamma photon. The final nucleus formed has an atomic number
a) 200 b) 199 c) 83 d) 198

186. Which of these is a fusion reaction
a) ${}^{3}_{1}H + {}^{2}_{1}H = {}^{4}_{2}He + {}^{1}_{0}n$ b) ${}^{238}_{92}U \rightarrow {}^{206}_{82}Pb + 8({}^{4}_{2}He) + 6({}^{0}_{-1}\beta)$
c) ${}^{12}_{7}C \rightarrow {}^{12}_{6}C + \beta^{+} + \gamma$ d) None of these

187. When a sample of solid lithium is placed in a flask of hydrogen gas then following reaction happened
${}^{1}_{1}H + {}_{3}Li^{7} \rightarrow {}_{2}He^{4} + {}_{2}He^{4}$
This statement is



a) True b) False
c) May be true at a particular pressure d) None of these

188. Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ. If R is the Rydberg constant, the principal quantum number n of the excited state is

a) $\sqrt{\frac{\lambda R}{\lambda R-1}}$ b) $\sqrt{\frac{\lambda}{\lambda R-1}}$ c) $\sqrt{\frac{\lambda R^2}{\lambda R-1}}$ d) $\sqrt{\frac{\lambda R}{\lambda-1}}$

189. If the atom ${}_{100}Fm^{257}$ follows the Bohr model and the radius of ${}_{100}Fm^{257}$ is n times the Bohr radius, then find n

a) 100 b) 200 c) 4 d) 1/4

190. The process by which a heavy nucleus splits into light nuclei is known as

a) Fission b) α-decay c) Fusion d) Chain reaction

191. The energy of electron in first excited state of H-atom is $-3.4\ eV$ its kinetic energy is

a) $-3.4\ eV$ b) $+3.4\ eV$ c) $-6.8\ eV$ d) $6.8\ eV$

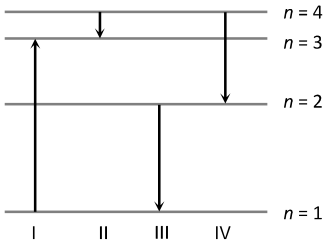
192. The binding energy of nucleus is a measure of its

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

193. The energy required to excite an electron from the ground state of hydrogen atom to the first excited state, is

a) $1.602 \times 10^{-14} J$ b) $1.619 \times 10^{-16} J$ c) $1.632 \times 10^{-18} J$ d) $1.656 \times 10^{-20} J$

194. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy



a) I b) II c) III d) IV

195. The spectral series of the hydrogen spectrum that lies in the ultraviolet region is the

a) Balmer series b) Pfund series c) Paschen series d) Lyman series

196. Hydrogen atom is excited from ground state to another state with principal quantum number equal to 4. Then the number of spectral lines in the emission spectra will be

a) 2 b) 3 c) 5 d) 6

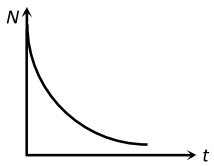
197. Activity of a radioactive sample decreases to $(1/3)^{rd}$ of its original value in 3 days. Then, in 9 days its activity will become

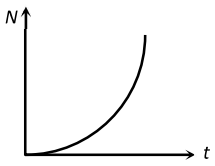
a) (1/27) of the original value b) (1/9) of the original value
c) (1/18) of the original value d) (1/3) of the original value

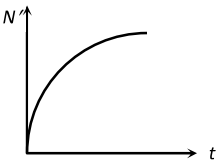
198. If 20 g of a radioactive substance due to radioactive decay reduces to 10 g in 4 minutes, then in what time 80 g of the same substance will reduce to 10 g

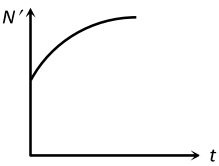
a) In 8 *minutes* b) In 12 *minutes* c) In 16 *minutes* d) In 20 *minutes*

199. The graph between number of decayed atoms N' of a radioactive element and time t is

a) 

b) 

c) 

d) 

200. Consider a hydrogen like atom whose energy in n^{th} excited state is given by $E_n = -\frac{13.6Z^2}{n^2}$. When this excited atom makes a transition from excited state to ground state, most energetic photons have energy $E_{max} = 52.224\ eV$ and least energetic photons have energy $E_{min} = 1.224\ eV$. The atomic number of atom is

a) 2 b) 5 c) 4 d) None of these

201. If radius of the ${}^{27}_{13}Al$ nucleus is estimated to be 3.6 $fermi$ then the radius of ${}^{125}_{52}Te$ nucleus be nearly

a) 4 $Fermi$ b) 5 $Fermi$ c) 6 $Fermi$ d) 8 $Fermi$

202. An electron changes its position from orbit $n = 4$ to the orbit $n = 2$ of an atom. The wavelength of the emitted radiation is (R = Rydberg's constant)
a) $\frac{16}{R}$ b) $\frac{16}{3R}$ c) $\frac{16}{5R}$ d) $\frac{16}{7R}$

203. The half-life of radon is 3.8 days. How many radon will be left out of 1024 mg after 38 days
a) 1 mg b) 2 mg c) 3 mg d) 4 mg

204. The α-particle is the nucleus of an atom of
a) Neon b) Hydrogen c) Helium d) Deuterium

205. Two nuclei have their mass numbers in the ratio of 1:3. The ratio of their nuclear densities would be
a) 1:3 b) 3:1 c) $(3)^{1/3}$:1 d) 1:1

206. In a radioactive material the activity at time t_1 is R_1 and at a later timet_2, it is R_2. If the decay constant of the material is λ , then
a) $R_1 = R_2 e^{-\lambda(t_1 - t_2)}$ b) $R_1 = R_2 e^{\lambda(t_1 - t_2)}$ c) $R_1 = R_2\ (t_2/t_1)$ d) $R_1 = R_2$

207. When a hydrogen atom emits a photon in going from $n = 5$to $n = 1$, its recoil speed is almost
a) 10^{-4} ms^{-1} b) 8×10^{2} ms^{-1} c) 2×10^{-2} ms^{-1} d) 4 ms^{-1}

208. The nuclear reaction $^{2}H + {}^{2}H \rightarrow {}^{4}He$ (mass of deuteron = 2.0141 $a.m.u.$ and mass of He = 4.0024 $a.m.u.$) is
a) Fusion reaction releasing 24 MeV energy
b) Fusion reaction absorbing 24 MeV energy
c) Fission reaction releasing 0.0258 MeV energy
d) Fission reaction absorbing 0.0258 MeV energy

209. If an electron jumps from 1st orbital to 3rd orbital, then it will
a) Absorb energy b) Release energy c) No gain of energy d) None of these

210. A radioactive nucleus emits 3α-particles and 5β-particles. The ratio of number of neutrons to that of protons will be
a) $\frac{A - Z - 12}{Z - 6}$ b) $\frac{A - Z}{Z - 1}$ c) $\frac{A - Z - 11}{Z - 6}$ d) $\frac{A - Z - 11}{Z - 1}$

211. Isobars are formed by
a) α −decay b) β −decay c) γ −deacy d) h −decay

212. The fraction of the initial number of radioactive nuclei which remain undecayed after half of a half-life of the radioactive sample is
a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{2}$ c) $\frac{1}{2\sqrt{2}}$ d) $\frac{1}{4}$

213. The ionization energy of hydrogen atom is 13.6 eV. Following Bohr's theory, the energy corresponding to a transition between the 3rd and the 4th orbit is
a) 3.40 eV b) 1.51 eV c) 0.85 eV d) 0.66 eV

214. A radioactive substance has an average life of 5h. In a time of 5 h
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

215. If Avogadro number is 6×10^{23}, then number of protons, neutrons and electrons is 14 g of $_{6}C^{14}$ are respectively
a) $36 \times 10^{23}, 48 \times 10^{23}, 36 \times 10^{23}$ b) $36 \times 10^{23}, 36 \times 10^{23}, 36 \times 10^{23}$
c) $48 \times 10^{23}, 36 \times 10^{23}, 48 \times 10^{23}$ d) $48 \times 10^{23}, 48 \times 10^{23}, 36 \times 10^{23}$

216. If the binding energy per nucleon of deutron is 1.115 MeV, its mass defect in atomic mass unit is
a) 0.0048 b) 0.0024 c) 0.0012 d) 0.0006

217. The Rutherford α-particle experiment shows that most of the α-particles pass through almost unscattered while some are scattered through the large angles. What information does it give about the structure of the atom

a) Atom is hollow
b) The whole mass of the atom is concentrated in a small centre called nucleus
c) Nucleus is positively charged
d) All the above

218. $^{238}_{92}$U has 92 protons and 238 nucleons. It decays by emitting an alpha particle and becomes
a) $^{234}_{92}$U b) $^{234}_{90}$Th c) $^{235}_{92}$U d) $^{237}_{93}$Np

219. The ratio of the speed of the electron in the first Bohr orbit of hydrogen and the speed of light is equal to (where e, h and c have their usual meanings)
a) $2\pi hc/e^2$ b) $e^2h/2\pi c$ c) $e^2c/2\pi h$ d) $2\pi e^2/hc$

220. Two protons are kept at a separation of 40 Å. F_n is the nuclear force and F_e is the electrostatic force between them. Then
a) $F_n >> F_e$ b) $F_n = F_e$ c) $F_n << F_e$ d) $F_n \approx F_e$

221. ^{234}U has 92 protons and 234 nucleons total in the nucleus. It decays by emitting an alpha particle. After the decay it becomes
a) ^{232}U b) ^{232}Pa c) ^{230}Th d) ^{230}Ra

222. Sun maintains its shining because of the
a) Fission of helium b) chemical reaction
c) Fusion of hydrogen nuclei d) Burning of carbon

223. The neutron was discovered by
a) Marie Curie b) Pierre Curie c) James Chadwick d) Rutherford

224. With the increase in principal quantum number, the energy difference between the two successive energy levels
a) Increases b) Decreases
c) Remains constant d) Sometimes increases and sometimes decreases

225. Complete the equation for the following fission process $_{92}U^{235} + {}_0n^1 \rightarrow \ldots\ldots\ldots {}_{38}Kr^{90} + \ldots\ldots\ldots$
a) $_{50}Xe^{143} + 3\ {}_0n^1$ b) $_{54}Xe^{145}$ c) $_{57}Xe^{142}$ d) $_{54}Xe^{142} + {}_0n^1$

226. Unit of radioactivity is $Rutherford$. Its value is
a) $3.7 \times 10^{10}\ disintegrations/s$ b) $3.7 \times 10^{6}\ disintegrations/s$
c) $1.0 \times 10^{10}\ disintegrations/s$ d) $1.0 \times 10^{6}\ disintegrations/s$

227. If half life of a radioactive element is 3 $hours$, after 9 $hours$ its activity becomes
a) 1/9 b) 1/27 c) 1/6 d) 1/8

228. If $N_1 = N_0 e^{-\lambda t_1}$, then the number of atoms decayed during time interval from t_1 and $t_2 (t_2 > t_1)$ will be
a) $N_{t_1} = N_{t_2} = N_o[e^{-\lambda t_1} - e^{-\lambda r_2}]$ b) $N_{t_2} = N_{t_1} = N_o[e^{-\lambda t_2} - e^{-\lambda t_1}]$
c) $N_{t_2} - N_{t_1} = N_o[e^{\lambda t}2 - e^{-\lambda t_1}]$ d) None of the above

229. The ratio of ionization energy of Bohr's hydrogen atom and Bohr's hydrogen like lithium atom is
a) 1 : 1 b) 1 : 3 c) 1 : 9 d) None of these

230. The ratio of the longest to shortest wavelengths in Lyman series of hydrogen spectra is
a) $\frac{25}{9}$ b) $\frac{17}{6}$ c) $\frac{9}{5}$ d) $\frac{4}{3}$

231. The Rydberg constant R for hydrogen is
a) $R = -\left(\frac{1}{4\pi\varepsilon_0}\right).\frac{2\pi^2me^2}{ch^2}$ b) $R = \left(\frac{1}{4\pi\varepsilon_0}\right).\frac{2\pi^2me^4}{ch^2}$
c) $R = \left(\frac{1}{4\pi\varepsilon_0}\right)^2.\frac{2\pi^2me^4}{c^2h^2}$ d) $R = \left(\frac{1}{4\pi\varepsilon_0}\right)^2.\frac{2\pi^2me^4}{ch^3}$

232. 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

233. An electron in the $n = 1$ orbit of hydrogen atom is bounded by 13.6 eV. Energy requires to ionize it is
a) 13.6 eV b) 6.53 eV c) 5.4 eV d) 1.51 eV

234. In an atomic bomb, the energy is released due to
   a) Chain reaction of neutrons and $_{92}U^{235}$ b) Chain reaction of neutrons and $_{92}U^{238}$
   c) Chain reaction of neutrons and $_{92}U^{240}$ d) Chain reaction of neutrons and $_{92}U^{236}$
235. The radioactivity isotope X with a half-life of 10^9year decays to Y which is stable. A sample of rocks were found to contain both the elements X and Y in the ratio 1: 7. What is the age of the rocks?
   a) 2×10^9yr b) 3×10^9yr c) 6×10^9yr d) 7×1^9yr
236. Two radioactive nuclides x and y have half-lifes 1 h and 2 h respectively. Initially the samples have equal number of nuclei. After 4 h the ratio of the numbers x of y and is
   a) $\frac{1}{2}$ b) 2 c) $\frac{1}{4}$ d) 1
237. A nucleus with $Z = 92$emits the following in a sequence : $\alpha, \alpha, \beta^-, \beta^-, \alpha, \alpha, \alpha, \alpha: \beta^-, \beta^-, \alpha, \beta^+, \beta^+, \alpha$. The Z of the resulting nucleus is
   a) 76 b) 78 c) 82 d) 74
238. An electron makes a transition from orbit $n = 4$ to the orbit $n = 2$ of a hydrogen atom. The wave number of the emitted radiations (R = Rydberg's constant) will be
   a) $\frac{16}{3R}$ b) $\frac{2R}{16}$ c) $\frac{3R}{16}$ d) $\frac{4R}{16}$
239. Fusion reaction take 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
240. Plutonium decays with half-life of 24000 yr. If plutonium is stored for 7200 yr, the fraction of it that remains is
   a) 1/8 b) 1/3 c) 1/4 d) 1/2
241. Activity of a radioactive element decreased to one-third of original activity I_0 in 9 yr. After further 9 yr, its activity will be
   a) I_0 b) $\frac{2}{3}I_0$ c) $I_0/9$ d) $I_0/3$
242. In the above figure D and E respectively represent
   a) Absorption line of Balmer series and the ionization energy of hydrogen
   b) Absorption line of Balmer series and the wavelength lesser than lowest of the Lyman series
   c) Spectral line of Balmer series and the maximum wavelength of Lyman series
   d) Spectral line of Lyman series and the absorption of greater wavelength of limiting value of Paschen series
243. The equation $_ZX^A \rightarrow {}_{Z+1}Y^A + {}_{-1}e^0 + \bar{\nu}$ is
   a) β-emission b) α-emission c) e^-capture d) Fission
244. 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
245. The half life (T) and the disintegration constant (λ) of a radioactive substance are related as
   a) $\lambda T = 1$ b) $\lambda T = 0.693$ c) $\frac{T}{\lambda} = 0.693$ d) $\frac{\lambda}{T} = 0.693$
246. In Bohr's model of hydrogen atom, let PE represents potential energy and TE the total energy. In going to a higher level
   a) PE decreases, TE increases b) PE increases, TE increases
   c) PE decreases, TE decreases d) PE increases, TE decreases
247. A hydrogen atom and a Li^{++}ion are both in second excited state. If l_H and l_{Li} are their respective electronic angular momenta, and $E_H$and E_{Li}their respective energies, then
   a) $l_H > l_{Li}$and $|E_H| > |>|E_{Li}|$ b) $L_H = L_i$and $|E_H| < E_{Li}|$

c) $l_H > l_{Li}$ and $|E_H| > E_{Li}|$ d) $l_H > l_{Li}$ and $|E_H| << E_{Li}|$

248. The atoms of same element having different masses but same chemical properties, are called
a) Isotones b) Isotopes c) Isobars d) Isomers

249. The mass equivalent at 931 MeV energy is
a) $1.66 \times 10^{-27} kg$ b) $6.02 \times 10^{-24} kg$ c) $1.66 \times 10^{-20} kg$ d) $6.02 \times 10^{-27} kg$

250. Atomic weight of boron is 10.81 and it has two isotopes ${}_5B^{10}$ and ${}_5B^{11}$. Then ratio of ${}_5B^{10}$: ${}_5B^{11}$ in nature would be
a) 19:81 b) 10:11 c) 15:16 d) 81:19

251. A freshly prepared radioactive source of half-life 2 h emits radiation of intensity which is 64 times the permissible safe level. Calculate the minimum time after which it would be possible to work safely with this source.
a) 12 h b) 24 h c) 6 h d) 130 h

252. 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)
a) $8.2 \times 10^{10} J$ b) $8.2 \times 10^{9} J$ c) $8.2 \times 10^{13} J$ d) $8.2 \times 10^{16} J$

253. In Raman effect, Stoke's lines are spectral lines having
a) Frequency greater than that of the original line
b) Wavelength equal to that of the original line
c) Wavelength less than that of the original line
d) Wavelength greater than that of the original line

254. The ionization energy of Li^{++} is equal to
a) $9hcR$ b) $6hcR$ c) $2hcR$ d) hcR

255. Which of the following is true
a) Lyman series is a continuous spectrum
b) Paschen series is a line spectrum in the infrared
c) Balmer series is a line spectrum in the ultraviolet
d) The spectral series formula can be derived from the Rutherford model of the hydrogen atom

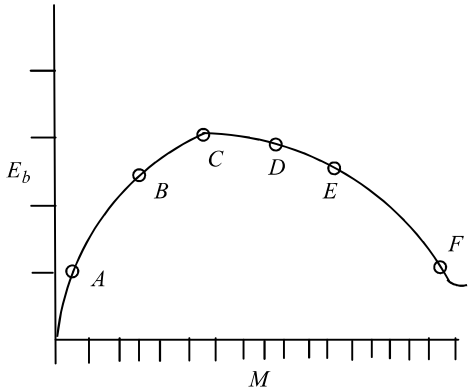
256. The above is a plot of binding energy per nucleon E_b, against the nuclear mass M; A, B, C, D, E, F correspond to different nuclei. Consider four reactions

$A + B \rightarrow C + \varepsilon$

$C \rightarrow A + B + \varepsilon$

$D + E \rightarrow F + \varepsilon$

$F \rightarrow D + E + \varepsilon$



where ε is the energy released? In which reaction is ε positive?
a) (i) and (iv) b) (i) and (iii) c) (ii) and (iv) d) (ii) and (iii)

257. Ratio of the wavelengths of first line of Lyman series and first time of Balmer series is
a) 1 : 3 b) 27 : 5 c) 5 : 27 d) 4 : 9

258. Radioactive ${}^{60}_{27}Co$ is transformed into stable ${}^{60}_{28}Ni$ by emitting two γ-rays of energies

a) 1.33 MeV and 1.17 MeV in succession
b) 1.17 MeV and 1.33 MeV in succession
c) 1.37 MeV and 1.13 MeV in succession
d) 1.13 MeV and 1.37 MeV in succession

259. $_{92}U^{238}$ on absorbing a neutron goes over to $_{92}U^{239}$. This nucleus emits an electron to go over electron goes over to Plutonium. The resulting Plutonium can be expressed as
a) $_{94}U^{239}$ b) $_{92}U^{239}$ c) $_{93}U^{240}$ d) $_{92}U^{240}$

260. In artificial radioactivity, 1.414×10^6 nuclei are disintegrated into 10^6 nuclei in 10 min. The half-life in minutes must be
a) 5 b) 20 c) 15 d) 30

261. If λ_{max} is 6563 Å, then wavelength of second line for Balmer series will be
a) $\lambda = \frac{16}{3R}$ b) $\lambda = \frac{36}{5R}$ c) $\lambda = \frac{4}{3R}$ d) None of the above

262. When an electron jumps from a level $n = 4$ to $n = 1$, momentum of the recoiled hydrogen atom will be
a) 6.8×10^{-27}kg – ms^{-1} b) 12.75×10^{-19}kg – ms^{-1}
c) 136×10^{-19}kg – ms^{-1} d) zero

263. Two radioactive samples have decay constant $15x$ and $3x$. If they have the same number of nuclei initially, the ratio of number of nuclei after a time $\frac{1}{6x}$ is
a) $\frac{1}{e}$ b) $\frac{e}{2}$ c) $\frac{1}{e^4}$ d) $\frac{1}{e^2}$

264. 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
a) 2×58 b) 58 c) $58/2$ d) 3×58

265. The angular momentum of electron in n^{th} orbit is given by
a) nh b) $\frac{h}{2\pi n}$ c) $n\frac{h}{2\pi}$ d) $n^2\frac{h}{2\pi}$

266. When $_{92}U^{235}$ is bombarded with one neutron, fission occurs and the products are three neutrons, $_{36}Kr^{94}$, and
a) $_{56}Ba^{141}$ b) $_{54}Xe^{139}$ c) $_{56}Ba^{139}$ d) $_{58}I^{142}$

267. In the lowest energy level of hydrogen atom, the electron has the angular momentum
a) π/h b) h/π c) $h/2\pi$ d) $2\pi/h$

268. Which one of the following is a possible nuclear reaction?
a) $^{10}_{5}B + ^{4}_{2}He \rightarrow ^{13}_{7}N + ^{1}_{1}H$ b) $^{23}_{11}Na + ^{1}_{1}H \rightarrow ^{20}_{10}Ne + ^{4}_{2}He$
c) $^{239}_{93}Np \rightarrow ^{239}_{94}Pu + \beta^- + \bar{\nu}$ d) $^{11}_{7}N + ^{1}_{1}H \rightarrow ^{12}_{6}C + \beta^- + \bar{\nu}$

269. In a radioactive decay, neither the atomic number nor the mass number of changes. Which of the following would be emitted in the decay process
a) Proton b) Neutron c) Electron d) Photon

270. The first line of Balmer series has wavelength 6563 Å. What will be the wavelength of the first member of Lyman series
a) 1215.4 Å b) 2500 Å c) 7500 Å d) 600 Å

271. Which of the following is not conserved in nuclear reaction?
a) Total energy b) Mass number
c) Charge Number d) Number of fundamental particles

272. Suppose an electron is attracted towards the origin by a force $\frac{k}{r}$ where 'k' is a constant and 'r' is the distance of the electron from the origin. By applying Bohr model to this system, the radius of the n^{th} orbital of the electron is found to be 'r_n' and the kinetic energy of the electron to be 'T_n'. Then which of the following is true
a) T_n independent of n, $r_n \propto n$ b) $T_n \propto \frac{1}{n}$, $r_n \propto n$

c) $T_n \propto \frac{1}{n}, r_n \propto n^2$ d) $T_n \propto \frac{1}{n^2}, r_n \propto n^2$

273. The kinetic energy of an electron revolving around a nucleus will be
a) Four times of P.E. b) Double of P.E. c) Equal to P.E. d) Half of its P.E.

274. The half-life of a radioactive substance is 40 years. How long will it take to reduce to one fourth of its original amount and what is the value of decay constant
a) 40 year, 0.9173/year b) 90 year, 9.017/year c) 80 year, 0.0173/year d) None of these

275. In Bohr model of hydrogen atom, the ratio of periods of revolution of an electron in $n = 2$ and $n = 1$ orbits is
a) 2 : 1 b) 4 : 1 c) 8 : 1 d) 16 : 1

276. The counting rate observed from a radioactive source at $t = 0$ was 1600 counts^{-1} and at $t = 8$ s it was 100counts^{-1}. The counting rate observed as counts per seconds at $t = 6$s, will be
a) 400 b) 300 c) 250 d) 200

277. Ionization power and penetration range of radioactive radiation increases in the order
a) γ, β, α and γ, β, α respectively b) γ, β, α and α, β, γ respectively
c) α, β, γand α, β, γ respectively d) α, β, γand γ, β, α respectively

278. The half life period of radium is 1600 $years$. The fraction of a sample of radium that would remain after 6400 $years$ is
a) 1/4 b) 1/2 c) 1/8 d) 1/16

279. The sun radiates energy in all directions. The average radiations received on the earth surface from the sun is 1.4 $kilowatt/m^2$. The average earth sun distance is $1.5 \times 10^{11} metres$. The mass lost by the sun per day is ($1\ day = 86400\ seconds$)
a) $4.4 \times 10^9 kg$ b) $7.6 \times 10^{14} kg$ c) $3.8 \times 10^{12} kg$ d) $3.8 \times 10^{14} kg$

280. A nuclear bomb exploded 200 km above the surface of moon. The sound of explosion on the moon
a) Will be heard before the explosion is seen b) Will be heard at the same time
c) Will be heard after explosion d) Will not be heard at all

281. The phenomena in which proton flips is
a) Nuclear magnetic resonance b) Lasers
c) Radioactivity d) Nuclear fusion

282. One milligram of matter converted into energy will give
a) 90 J b) $9 \times 10^3\ J$ c) $9 \times 10^{10}\ J$ d) $9 \times 10^5\ J$

283. Which one of the following nuclear reactions is a source of energy in the sun
a) ${}^{9}_{4}Be + {}^{4}_{2}He \rightarrow {}^{12}_{6}C + {}^{-1}_{0}n$ b) ${}^{3}_{2}He + {}^{3}_{2}He \rightarrow {}^{4}_{2}He + {}^{1}_{1}H + {}^{1}_{1}H$
c) ${}^{144}_{56}Ba + {}^{92}_{56}Kr \rightarrow {}^{235}_{92}U + {}^{-1}_{0}n$ d) ${}^{56}_{26}Fe + {}^{112}_{48}Ca \rightarrow {}^{167}_{74}W + {}^{-1}_{0}n$

284. If in nature there may not be an element for which the principle quantum number $n > 4$, then the total possible number of elements will be
a) 60 b) 32 c) 4 d) 64

285. Which can pass through 20 cm thickness of the steel
a) α −particles b) β −particles c) γ −rays d) Ultraviolet rays

286. Which of the following spectral series in hydrogen atom give spectral line of 4860 Å
a) Lyman b) Balmer c) Paschen d) Brackett

287. The half-life of Radioactive substance is 20 min. The approximate time interval$(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of it has decayed and time t_1 when $\frac{1}{3}$ of it had decayed is
a) 14 min b) 20 min c) 28 min d) 7 min

288. For nuclear forces to be effective, the distance should be
a) 10^{-10} m b) 10^{-11} m c) 10^{-15} m d) 10^{-20} m

289. Consider an electron in the n^{th} orbit of a hydrogen atom in the Bohr model. The circumference of the orbit can be expressed in terms of the de Broglie wavelength λ of that electron as
a) $(0.259)n\lambda$ b) $\sqrt{n}\lambda$ c) $(13.6)\lambda$ d) $n\lambda$

290. The mass number of He is 4 and that for sulphur is 32. The radius of sulphur nucleus is larger than that of helium, by times
a) $\sqrt{8}$ b) 4 c) 2 d) 8

291. A small quantity of solution containing Na^{24} radio nuclide of activity 1 $microcurie$ is injected into the blood of a person. A sample of the blood of volume $1cm^3$ taken after 5 hours shows an activity of 296 disintegration per minute. What will be the total volume of the blood in the body of the person. Assume that the radioactive solution mixes uniformly in the blood of the person
(Take 1 $curie = 3.7 \times 10^{10}$ disintegration per second and $e^{-\lambda t} = 0.7927$; where $\lambda =$ disintegration constant)
a) 5.94 $litre$ b) 2 $litre$ c) 317 $litre$ d) 1 $litre$

292. If a proton and anti-proton come close to each other and annihilate, how much energy will be released
a) $1.5 \times 10^{-10} J$ b) $3 \times 10^{-10} J$ c) $4.5 \times 10^{-10} J$ d) None of these

293. Two lithium nuclei in a lithium vapour at room temperature do not combine to form a carbon nucleus because
a) Carbon nucleus is an unstable particle
b) It is not energetically favourable
c) Nuclei do not come very close due to Coulombic repulsion
d) Lithium nucleus is more tightly bound than a carbon nucleus

294. The binding energy of two nuclei P^n and Q^{2n} are x joule and y joule respectively. If 2 $x > y$, then the energy released in the reaction $P^n + P^n = Q^{2n}$ will be
a) $2\,x + y$ b) $2\,x - y$ c) xy d) $x + y$

295. Atomic reactor is based on
a) Controlled chain reaction b) uncontrolled chain reaction
c) Nuclear fission d) Nuclear fussion

296. A radioactive sample is α-emitter with half life 138.6 days is observed by a student to have 2000 disintegration/s. The number of radioactive nuclei for given activity are
a) 3.45×10^{10} b) 1×10^{10} c) 3.45×10^{15} d) 2.75×10^{11}

297. A radio-isotope has a half-life of 5 $years$. The fraction of the atoms of this material that would decay in 15 $years$ will be
a) 1/8 b) 2/3 c) 7/8 d) 5/8

298. The number of α-particles and β − particles respectively emitted in the reaction ${}_{88}A^{196} \rightarrow {}_{78}B^{164}$ are
a) 8 and 8 b) 8 and 6 c) 6 and 8 d) 6 and 6

299. π mesons can be
a) π^+ or π^- b) π^+ or π^0 c) π^- or π^0 d) π^+, π^- or π^0

300. How much work must be done to pull apart the electron and the proton that make up the Hydrogen atom, if the atom is initially in the state with $n = 2$
a) $13.6 \times 1.6 \times 10^{-19} J$ b) $3.4 \times 1.6 \times 10^{-19} J$ c) $1.51 \times 1.6 \times 10^{-19} J$ d) 0

301. If in Rutherford's experiment, the number of particles scattered at 90° angle are 28 per min, then number of scattered particles at an angle 60° and 120° will be
a) $112/min, 12.5/min$ b) $100/min, 200/min$ c) $50/min, 125.5/min$ d) $117/min, 25/min$

302. 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)

303. The number of neutrons released during the fission reaction is ${}^{1}_{0}n + {}^{235}_{92}\text{U} \rightarrow {}^{133}_{51}\text{Sb} + {}^{99}_{41}\text{Nb}$ +neutrons
a) 1 b) 92 c) 3 d) 4

304. A radioactive element A decays into B with a half-life of 2 days. A fresh prepared sample of A has a mass of 12 g. What mass of A and B are there in the sample after 4 days?
a) $A = 3\text{g}, B = 9\text{g}$ b) $A = 6\text{g}, B = 6\text{g}$ c) $A = 12\text{g}, B = 0\text{g}$ d) $A = 9\text{g}, B = 3\text{g}$

305. Pick out the correct statement from the following.
a) Energy released per unit mass of the reactant is less in case of fusion reaction

b) Packing fraction may be positive or may be negative
c) Pu^{239} is not suitable for a fission reaction
d) For stable nucleus, the specific binding energy is low

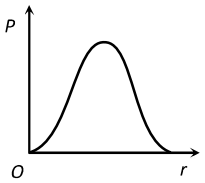
306. For a nuclear to be in critical condition, the value of neutron multiplication factor (k) must be
a) $k > 1$ b) $k < 1$ c) $k = 1$ d) $k = 0$

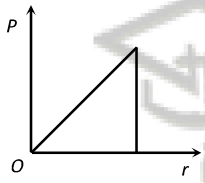
307. Two nucleons are at a separation of one fermi. Protons have a charge of $+1.6 \times 10^{-19}$ C. The net nuclear force between them is F_1, if both are neutrons ,F_2 if both are protons and F_3 if one is proton and the other is neutron. Then
a) $F_1 = F_2 > F_3$ b) $F_1 = F_2 = F_3$ c) $F_1 < F_2 < F_3$ d) $F_1 > F_2 > F_3$

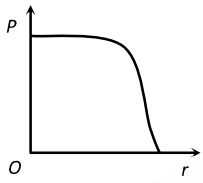
308. In a beryllium atom, if a_0 be the radius of the first orbit, then the radius of the second orbit will be will be in general
a) na_0 b) a_0 c) n^2a_0 d) $\frac{a_0}{n^2}$

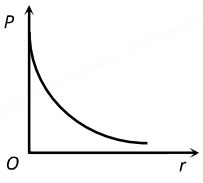
309. For a nucleus to be stable, the correct relation between neutron number N and proton number Z is
a) $N > Z$ b) $N = Z$ c) $N < Z$ d) $N \geq Z$

310. In β^+ decay process, the following changes take place inside the nucleus
a) ${}^{A}_{Z}X \rightarrow {}^{A}_{Z-1}Y + e^+ + \gamma$ b) ${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}Y + e^- + \bar{r}$
c) ${}^{A}_{Z}X \rightarrow {}^{A}_{Z}Y + e^- + \gamma$ d) ${}^{A}_{Z}X \rightarrow {}^{A}_{Z}Y + e^- + \bar{\gamma}$

311. The change density in a nucleus varies with distance from the centre of the nucleus according to the curve in Fig.
a) 

b) 

c) 

d) 

312. The ratio of the nuclear radii of elements with mass numbers 216 and 125 is
a) 216:125 b) $\sqrt{216}:\sqrt{125}$ c) 6:5 d) None of these

313. A free neutron decays spontaneously into
a) A proton ,an electron and antineutrino
b) A proton ,an electron and aneutrino
c) A proton and electron
d) A proton, and electron , a neutrino and an antineutrino

314. Hydrogen atom excites energy level from fundamental state to $n = 3$. Number of spectrum lines according to Bohr, is
a) 4 b) 3 c) 1 d) 2

315. A hydrogen atom in its ground state absorbs 10.2 eV of energy. The orbital angular momentum is increased by
(Given Planck's constant $h = 6.6 \times 10^{-34} J - s$)
a) $1.05 \times 10^{-34} J\text{-}s$ b) $3.16 \times 10^{-34} J\text{-}s$ c) $2.11 \times 10^{-34} J\text{-}s$ d) $4.22 \times 10^{-34} J\text{-}s$

316. A double charged lithium atom is equivalent to hydrogen whose atomic number is 3. The wavelength of required radiation for emitting electron from first to third Bohr orbit in Li^{++} will be (Ionisation energy of hydrogen atom is $13.6eV$)
a) 182.51 Å b) 177.17 Å c) 142.25 Å d) 113.74 Å

317. A radioactive sample at any instant has its disintegration rate 5000 disintegrations per minute. After 5 min, the rate becomes 1250 disintegration per minute. Then ,its decay constant (per minute) is
a) $0.8 \log_e 2$ b) $0.4 \log_e 2$ c) $0.2 \log_e 2$ d) $0.1 \log_e 2$

318. If the radioactive decay constant of radium is 1.07×10^{-4} per year, then its half life period is approximately equal to

a) 8,900 *years* b) 7,000 *years* c) 6,476 *years* d) 2,520 *years*

319. What is the Q-value of the reaction
$P + {}^{7}\text{Li} \rightarrow {}^{4}\text{He} + {}^{4}\text{He}$
The atomic masses of ${}^{1}\text{H}$, ${}^{4}\text{He}$ *and* ${}^{7}\text{Li}$ are 1.007825 u, 4.002603 u and 7.016004 u respectively
a) 17.35 MeV b) 18.06 MeV c) 177.35 MeV d) 170.35 MeV

320. In hydrogen atom, electron makes transition from $n = 4$ to $n = 1$ level. Recoil momentum of the H atom will be
a) $3.4 \times 10^{-27} N - s$ b) $6.8 \times 10^{-27} N - s$ c) $3.4 \times 10^{-24} N - s$ d) $6.8 \times 10^{-24} N - s$

321. The functions of moderators in nuclear reactor is to
a) Decrease the speed of neutrons b) Increase the speed of neutrons
c) Decrease the speed of electrons d) Increase the speed of electrons

322. Which of the following transitions will have highest emission wavelength
a) $n = 2$ to $n = 1$ b) $n = 1$ to $n = 2$ c) $n = 2$ to $n = 5$ d) $n = 5$ to $n = 2$

323. Hydrogen bomb is based on which of the following phenomenon
a) Nuclear fission b) Nuclear fusion c) Radioactive decay d) None of these

324. 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
a) $N_0/8$ b) $N_0/16$ c) $N_0/2$ d) $N_0/4$

325. The nuclear fusion reaction is given ${}_{1}\text{H}^{2} + {}_{1}\text{H}^{2} \rightarrow {}_{0}\text{He}^{3} + {}_{0}n^{1} + Q$ (energy). If 2 mole of deuterium are fused the total released energy is
a) $2Q$ b) $4Q$ c) $Q \times 6.02 \times 10^{23}$ d) $Q \times 2 \times 6 \times 10^{23}$

326. When hydrogen atom is in its first excited level, its radius is …… its ground state radius
a) Half b) Same c) Twice d) Four times

327. What is the disintegration constant of radon if the number of its atoms diminishes by 18%in 24 h?
a) $2.1 \times 10^{-3}\ \text{s}^{-1}$ b) $2.1 \times 10^{-4}\ \text{s}^{-1}$ c) $2.1 \times 10^{-5}\ \text{s}^{-1}$ d) $2.1 \times 10^{-6}\ \text{s}^{-1}$

328. In the uranium radioactive series, the initial nucleus is ${}_{92}\text{U}^{238}$ and that the final nucleus is ${}_{82}\text{Pb}^{206}$. When uranium nucleus decays to lead, the number of α-particle and β-particles emitted are
a) 8α, 6β b) 6α, 7β c) 6α, 8β d) 4α, 3β

329. Which of the relation is correct between time period and number of orbits while an electron is revolving in an orbit
a) n^2 b) $\frac{1}{n^2}$ c) n^3 d) $\frac{1}{n}$

330. Which energy state of the triply ionized beryllium has the same electron orbital radius as that of ground state of hydrogen? Given Z for Be=4
a) $n = 4$ b) $n = 3$ c) $n = 2$ d) $n = 1$

331. In hydrogen atom which quantity is integral multiple of $\frac{h}{2\pi}$
a) Angular momentum b) Angular velocity c) Angular acceleration d) Momentum

332. Boron rods in nuclear reactor are used as a
a) Moderator b) Control rods c) Coolants d) Protective shield

333. Select the true statement from the following. Nuclear force is
a) Strong, short range and charge independent force.
b) charge independent, attractive and long range force.
c) Strong, charge dependent and short range attractive force
d) Long range, charge dependent and attractive force.

334. The binding energy per nucleon for the parent nucleus is E_1 and that for the daughter nuclei is E_2. Then
a) $E_2 = 2E_1$ b) $E_1 > E_2$ c) $E_2 > E_1$ d) $E_1 = 2E_2$

335. One Becquerel is defined as
a) 1 disintegration per sec b) 10^6 disintegration per sec
c) 3.7×10^{10} disintegration per sec d) 10^3 disintegration per sec

336. When the number of nucleons in nuclei increase, the binding energy per nucleon
   a) Increases continuously with mass number
   b) Decreases continuously with mass number
   c) Remains constant with mass number
   d) First increases and then decreases with increases of mass number

337. The decay constant of a radioactive sample is λ.The half-life and mean life of the sample are respectively given by
   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 $\frac{1}{\lambda}$

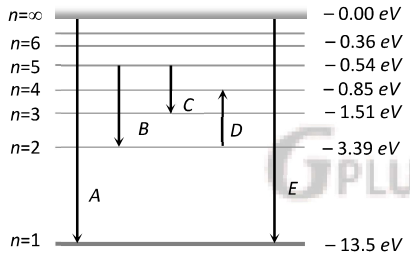
338. If λ is decay constant and $N$the number of radioactive nuclei of an element , then the decay rate (R) of that element is
   a) λN^2 b) λN c) $\frac{\lambda}{N}$ d) $\lambda^2 N$

339. If the decay constant of a radioactive substance is λ, then its half-life is
   a) $\frac{1}{\lambda}\log_e 2$ b) $\frac{1}{\lambda}$ c) $\lambda \log_e 2$ d) $\frac{\lambda}{\log_e 2}$

340. What is the mass of one curie of U^{234}?
   a) 3.7×10^{10}g b) 3.7×10^{-10}g c) 6.25×10^{-34}g d) 1.438×10^{-11}g

341. 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

342. The energy levels of the hydrogen spectrum is shown in figure. There are some transition A, B, C, D and E. Transition A, B and C respectively represent



   a) First member of Lyman series, third spectral line of Balmer series and the second spectral line of Paschen series
   b) Ionization potential of hydrogen, second spectral line of Balmer series and third spectral line of Paschen series
   c) Series limit of Lyman series, third spectral line of Balmer series and second spectral line of Paschen series
   d) Series limit of Lyman series, second spectral line of Balmer series and third spectral line of Paschen series

343. As the electron in Bohr orbit of Hydrogen atom passes from state $n = 2$ to $n = 1$, the kinetic energy K and potential energy U change as
   a) K two-fold, U four-fold b) K four-fold, U two-fold
   c) K four-fold, U also four-fold d) K two-fold, U also two-fold

344. The radius of the Bohr orbit in the ground state of hydrogen atom is 0.5 Å. The radius of the orbit of the electron in the third excited state of He^+ will be
   a) 8 Å b) 4 Å c) 0.5 Å d) 0.25 Å

345. The wavelength of radiation emitted is $\lambda_0$when an electron jumps from the third to second orbit of hydrogen atom. For the electron jump from fourth to the second orbit of the hydrogen atom, the wavelength of radiation emitted will be
   a) $(16/25)\lambda_0$ b) $(20/27)\lambda_0$ c) $(27/20)\lambda_0$ d) $(25/16)\lambda_0$

346. The mass of an α-particle is
   a) Less than the sum of masses of two protons and two neutrons
   b) Equal to mass of four protons
   c) Equal to mass of four neutrons
   d) Equal to sum of masses of two protons and two neutrons

347. Activity of radioactive element decreased to one third of original activity R_0 in 9 years. After further 9 years, its activity will be
   a) R_0 b) $\frac{2}{3}R_0$ c) $R_0/9$ d) $R_0/6$

348. The ratio of longest wavelength and the shortest wavelength observed in the five spectral series of emission spectrum of hydrogen is
   a) $\frac{4}{3}$ b) $\frac{525}{376}$ c) 25 d) $\frac{900}{11}$

349. 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

350. Age of a tree is determined using radio-isotope of
   a) Carbon b) Cobalt c) Iodine d) Phosphorus

351. A radioactive isotope has a half-life of T years. How long will it take the activity to reduce to 1% of its original value
   a) $3.2T$ year b) 4.6 T year c) 6.6 T year d) 9.2 T year

352. The approximate nuclear radius is proportional to (A is the mass number and Z the atomic number)
   a) $\sqrt{A}$ b) $A^{1/3}$ c) $\sqrt{Z}$ d) $Z^{1/3}$

353. The radioactivity of a certain material drops to $\frac{1}{16}$ of the initial value in 2h. The half-life of this radio nuclide is
   a) 10 min b) 20 min c) 30 min d) 40 min

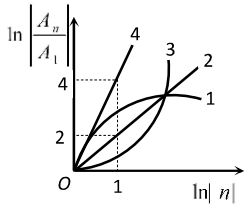
354. The ionization potential of H-atom is $13.6V$. When it is excited from ground state by monochromatic radiations of 970.6 Å, the number of emission lines will be (according to Bohr's theory)
   a) 10 b) 8 c) 6 d) 4

355. 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 $days$

356. The example of nuclear fusion is
   a) Formation of Ba and Kr from U^{235} b) Formation of He from H
   c) Formation of $Pu - 235$ from $U - 235$ d) Formation of water from hydrogen and oxygen

357. The binding energy per nucleon for deuteron and helium are 1.1MeV and 7.0MeV. The energy released when two deuterons fuse to form a helium nucleus is
   a) 23.6MeV b) 2.2MeV c) 30.2MeV d) 3.6MeV

358. The figure shows a graph between $\ln\left|\frac{A_n}{A_1}\right|$ and $\ln|n|$, where A_n is the area enclosed by the nth orbit in a hydrogen like atom. The correct curve is



   a) 4 b) 3 c) 2 d) 1

359. An atom of mass number 15 and atomic number 7 captures an α −particle and then emits a proton. The mass number and atomic number of the resulting product will respectively be
a) 14 and 2 b) 15 and 3 c) 16 and 4 d) 18 and 8

360. The relationship between λ and half life ($T_{1/2}$) of a radioactive substance is
a) $\lambda = \frac{\log_{10} 2}{T_{1/2}}$ b) $\lambda = \frac{\log_e 2}{T_{1/2}}$ c) $\lambda = \frac{\log_2 10}{T_{1/2}}$ d) $\lambda = \frac{\log_2 e}{T_{1/2}}$

361. When two deuterium nuclei fuse together to form a tritium nuclei, we get a
a) Neutron b) Deuteron c) α −particle d) Proton

362. Nuclear reactions are given as
(i) $\square\ (n,p)_{15}p^{32}$ (ii) $\square\ (p,\alpha)_8O^{16}$ (iii) ${}_7N^{14}$ (iv) ${}_6C^{14}$
Missing particle or nuclide (in box $\square$) in these reactions are respectively
a) $S^{32}, F^{19}, {}_0n^1$ b) $F^{19}, S^{32}, {}_0n^1$ c) $Be^9, F^{19}, {}_0n^1$ d) None of these

363. Two nucleons are at a separation of 1 fm. The net force between them is F_1 if both neutrons, F_2 if both are protons, and F_3 if one is a proton and the other is a neutron.
a) $F_1 > F_2 > F_3$ b) $F_2 > F_1 > F_3$ c) $F_1 = F_3 > F_2$ d) $F_1 = F_2 > F_3$

364. The fossil bone has a ${}^{14}C : {}^{12}C$ ratio, which is $\left[\frac{1}{16}\right]$ of that in a living animal bone. If the half-life of ${}^{14}C$ is 5730 yr, then the age of the fossil bone is
a) 11460 yr b) 17190 yr c) 22920 yr d) 45840yr

365. The half-life of a radioactive substance is 3.6 days. How much of 20 mg of this radioactive substance will remain after 36 days
a) 0.0019 mg b) 1.019 mg c) 1.109 mg d) 0.019 mg

366. Half-life of a radio active substance A is 4 days. The probability that a nucleus will decay in two half-lives is
a) $\frac{1}{4}$ b) $\frac{3}{4}$ c) $\frac{1}{2}$ d) 1

367. In a sample of radioactive material, what fraction of the initial number of active nuclei will remain undisintegrated after half of a half-life of the sample
a) $\frac{1}{4}$ b) $\frac{1}{2\sqrt{2}}$ c) $\frac{1}{\sqrt{2}}$ d) $2\sqrt{2}$

368. Assume that a neutron breaks into a photon and an electron. The energy released during this process is (mass of neutron $= 1.6725 \times 10^{-27} kg$, Mass of proton $= 1.6725 \times 10^{-27} kg$, mass of electron $= 9 \times 10^{-31} kg$)
a) 0.73 MeV b) 7.10 MeV c) 6.30 MeV d) 5.4 MeV

369. In radioactive decay process, the negatively charged emitted β − particles are
a) The electrons present inside the nucleus
b) The electrons produced as a result of the decay of neutrons inside the nucleus
c) The electrons produced as a result of collisions between atoms.
d) The electrons orbiting around the nucleus.

370. A radioactive material decays by simultaneous emission of two particles with half-lives 1620 yr and 810 yr respectively. The time in year after which one-fourth of the material remains , is
a) 4860 yr b) 3240 yr c) 2340 yr d) 1080yr

371. The binding energy per nucleon of deuterium and helium atom is 1.1 MeV and 7.0 MeV. If two deuterium nuclei fuse to form helium atom, the energy released is
a) 19.2 MeV b) 23.6 MeV c) 26.9 MeV d) 13.9 MeV

372. Out of the following which one is not a possible energy for a photon to be emitted by hydrogen atom according to Bohr's atomic model
a) 13.6 eV b) 0.65 eV c) 1.9 eV d) 11.1 eV

373. What is used as a moderator in a nuclear reactor?
a) Water b) Graphite c) Cadmium d) Steel

374. 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*

375. The particle that possesses half integral spin as
a) Photon b) Pion c) Proton d) K-meson

376. The radioactivity of a simple is I_1 at a time t_1 and I_2 at a time t_2. If the half-life of the sample is $\tau_{1/2}$, then the number of nuclei that have disintegrated in the time $t_2 - t_1$ is proportional to
a) $I_1 t_2 - I_2 t_1$ b) $I_1 - I_2$ c) $\frac{I_1 - I_2}{\tau_{1/2}}$ d) $(I_1 - I_2)\tau_{1/2}$

377. The radius of germanium (Ge) nuclide is measured to be twice the radius of $^{9}_{4}$Be. The number of nucleons in Ge are
a) 73 b) 74 c) 75 d) 72

378. The radioactivity of a certain radioactive element drops to 1/64 of its initial value in 30 *seconds*. Its half life is
a) 2 *seconds* b) 4 *seconds* c) 5 *seconds* d) 6 *seconds*

379. Hydrogen (H), deuterium (D), singly ionized helium (He^{+}) and doubly ionized lithium (Li^{++}) all have one electron around the nucleus. Consider $n = 2$ to $n = 1$ transition. The wavelengths of emitted radiations are $\lambda_1, \lambda_2, \lambda_3$ and λ_4 respectively. Then approximately
a) $\lambda_1 = \lambda_2 = 4\lambda_3 = 9\lambda_4$ b) $4\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$
c) $\lambda_1 = 2\lambda_2 = 2\sqrt{2}\lambda_3 = 3\sqrt{2}\lambda_4$ d) $\lambda_1 = \lambda_2 = 2\lambda_3 = 3\sqrt{2}\lambda_4$

380. Mean life of neutron is about
a) 100 seconds b) 1000 seconds c) 10 seconds d) 1 seconds

381. For principal quantum number $n = 3$, the possible values of orbital quantum number 'l' are
a) 1, 2, 3 b) 0, 1, 2, 3 c) 0, 1, 2 d) $-1, 0, +1$

382. To explain his theory, Bohr used
a) Conservation of linear momentum b) Conservation of angular momentum
c) Conservation of quantum frequency d) Conservation of energy

383. During negative β-decay
a) Neutron converts into proton b) Proton converts into neutron
c) Neutron proton ratio increases d) None of these

384. A radioactive substance has a half-life of four months. Three-fourth of the substance will decay in
a) 3 months b) 4 months c) 8 months d) 12 months

385. According to Bohr's theory, the moment of momentum of an electron revolving in second orbit of hydrogen atom will be
a) $2\pi h$ b) πh c) $\frac{h}{\pi}$ d) $\frac{2h}{\pi}$

386. $_{92}U^{235}$ and $_{92}U^{238}$ differ as
a) $_{92}U^{235}$ has 2 protons less b) $_{92}U^{238}$ has 3 protons more
c) $_{92}U^{238}$ has 3 neutrons more d) None of the above

387. Which of the following is true for number of spectral lines in going from Lyman series to P-fund series
a) Increases b) Decreases
c) Unchanged d) May decrease and increase

388. 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 $_{14}Si^{30}$

389. The kinetic energy of the electron in an orbit of radius r in hydrogen atom is (e = electronic charge)
a) $\frac{e^2}{r^2}$ b) $\frac{e^2}{2r}$ c) $\frac{e^2}{r}$ d) $\frac{e^2}{2r^2}$

390. If the binding energy per nucleon in $^{7}_{3}$Li and $^{4}_{2}$He nuclei are 5.60 MeV and 7.06 MeV respectively, then in the reaction

$p + {}^{7}_{3}\text{Li} \rightarrow 2\,{}^{4}_{2}\text{He}$

energy of proton must be

a) 28.24MeV b) 17.28MeV c) 1.46MeV d) 39.2MeV

391. In the Bohr's hydrogen atom model, the radius of the stationary orbit is directly proportional to (n = principle quantum number)

a) n^{-1} b) n c) n^{-2} d) n^{2}

392. 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

393. 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 g sample $per\ second$ will be
(Avogadro's number $N = 6.02 \times 10^{26} atom/kilomol$)

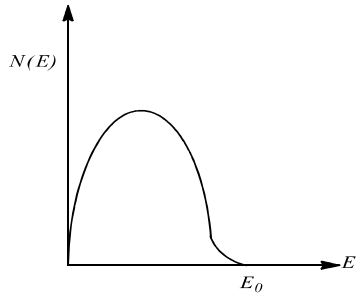
a) 3.61×10^{10} b) 3.6×10^{12} c) 3.11×10^{15} d) 31.1×10^{15}

394. r_1 and r_2 are the radii of atomic nuclei of mass numbers 64 and 27 respectively. The ratio (r_1/r_2) is

a) 64/27 b) 27/64 c) 4/3 d) 1

395. The energy spectrum of β − particles [number N(E) as a function of β −energy E] emitted from a radioactive source is

a)



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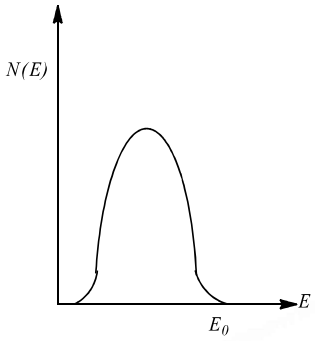

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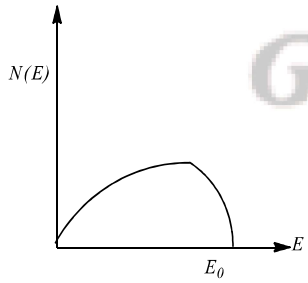
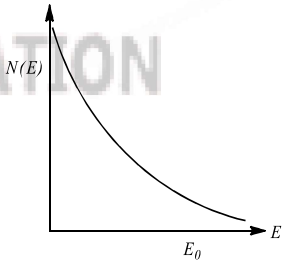


d)



396. 80 kg of a radioactive material reduces to 10 kg in 1 h. The decay constant of the material is

a) $5.80 \times 10^{-4}\ s^{-1}$ b) $1.16 \times 10^{-3}\ s^{-1}$ c) $2.32 \times 10^{-3}\ s^{-1}$ d) $4.64 \times 10^{-3}\ s^{-1}$

397. A radioactive sample S_1 having the activity A_1 has twice the number of nuclei as another sample S_2 of activityA_2. If $A_2 = 2A_1$, then the ratio of half-life of S_1 to the half-life of S_2 is

a) 4 b) 2 c) 0.25 d) 0.75

398. The intensity of gamma radiation from a given source is I_o. On passing through 37.5 mm of lead it is reduced to $I_o/8$. The thickness of lead which will reduce it to $I_o/2$ is

a) $(37.7)^{1/3}$mm b) $(37.5)^{1/4}$mm c) 37.5/3 mm d) (37.5/4) mm

399. The average binding energy per nucleon is maximum for the nucleus

a) ${}_2He^4$ b) ${}_8O^{16}$ c) ${}_{26}Fe^{56}$ d) ${}_{92}He^{238}$

400. If half life of radium is 77 days. Its decay constant in day will be

a) 3×10^{-13}/day b) 9×10^{-3}/day c) 1×10^{-3}/day d) 6×10^{-3}/day

401. The radius of a nucleus of a mass number A is directly proportional to

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

402. We have seen that a gamma-ray dose of 3Gy is lethal to half the people exposed to it. If the equivalent energy were absorbed as heat, what rise in body temperature would result?

a) 300 μK b) 700 μK c) 455 μK d) 390 μK

403. Which one is correct about fission?
a) Approx 0.1 % mass converts into energy
b) Most of energy of fission is in the form of heat
c) In a fission of U^{235} about 200 eV energy is released
d) On an average, one neutron is released per fission of U^{235}

404. 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

405. Consider the following two statements A and B identify the correct answer given
A: Nuclear density is same for all nuclei
B:Radius of the nucleus R and its mass the number A are related as $\sqrt{A} \propto R^{1/6}$
a) Both A and B are true b) Both A and B are false
c) A is true but B is false d) A is false but B is true

406. Complete the reaction $n + {}^{235}_{92}U \rightarrow {}^{144}_{56}Ba + \cdots + 3n$
a) ${}^{89}_{36}Kr$ b) ${}^{90}_{36}Kr$ c) ${}^{91}_{36}Kr$ d) ${}^{92}_{36}Kr$

407. In a sample of hydrogen like atoms all of which are in ground state, a photon beam containing photons of various energies is passed. In absorption spectrum, five dark lines, are observed. The number of bright lines in the emission spectrum will be (assume that all transitions takes place)
a) 5 b) 10 c) 15 d) None of these

408. 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) 120 min b) 80 min c) 30 min d) 20 min

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

410. Energy of an electron in an excited hydrogen atom is $-3.4\ eV$. Its angular momentum will be ($h = 6.626 \times 10^{-34} J - s$)
a) $1.11 \times 10^{34} J\ s$ b) $1.51 \times 10^{-31} J\ s$ c) $2.11 \times 10^{-34} J\ s$ d) $3.72 \times 10^{-34} J\ s$

411. A radioactive element forms its own isotope after 3 consecutive disintegrations. The particles emitted are
a) 3 β-particles b) 2 β-particles - 1 α-particle
c) 2 β-particles - 1 γ-particle d) 2 α-particles - 1 β-particle

412. Which of the following statements about the Bohr model of the hydrogen atom is false
a) Acceleration of electron in $n = 2$ orbit is less than that in $n = 1$ orbit
b) Angular momentum of electron in $n = 2$ orbit is more than that in $n = 1$ orbit
c) Kinetic energy of electron in $n = 2$ orbit is less than that in $n = 1$ orbit
d) Potential energy of electron in $n = 2$ orbit is less than that in $n = 1$ orbit

413. The particle A is converted into $C via$ following reaction.
$A \rightarrow B + {}_2He^4$
$B \rightarrow C + 2e^-$
Then
a) A and C are isobars b) A and C are isotopes c) A and B are isobars d) A and B are isotopes

414. Half life of radioactive element depends upon
a) Amount of element present b) Temperature
c) Pressure d) Nature of element

415. Consider the following statements
S1 : The nuclear force is independent of the charge of nucleons
S2 : The number of nucleons in the nucleus of an atom is equal to the number of electrons in the atom

S3 : All nuclei have masses that are less than the sum of the masses of constituent nucleons
S4 : Nucleons belong to the family of leptons while electrons are members of the family of hadrons
Choose the correct statement(s) from these
a) S1 only b) S1 and S4 c) S2, S3 and S4 d) S1 and S3

416. The number of electrons, neutrons and protons in a species are equal to 10, 8 and 8 respectively. The proper symbol of the species is
a) $^{16}O_8$ b) $^{18}O_8$ c) $^{18}Ne_{10}$ d) $^{16}O_8^{2-}$

417. If half-life of radium is 77days,its decay constant will be
a) 3×10^{-3}- day^{-1} b) 9×10^{-3}- day^{-1} c) 1×10^{-3}- day^{-1} d) 6×10^{-3}- day^{-1}

418. A certain radioactive material $_ZX^A$ starts emitting α and β particles successively such that the end product is $_{z-3}Y^{A-b}$. The number of αandβ particles emitted are
a) 4 and 3 respectively b) 2 and 1 respectively c) 3 and 4 respectively d) 3 and 8 respectively

419. A nucleus of $_{84}Po^{210}$originally at rest emits an α-particle with speed v. What will be recoil speed of the daughter nucleus?
a) $4v/206$ b) $4v/214$ c) $v/206$ d) $v/214$

420. A nucleus with mass number 220 initially at rest emits an α-particle. If the Q value of the reaction is 5.5 MeV, calculate the kinetic energy of the α-particle
a) $10^9\ K$ b) $10^7\ K$ c) $10^5\ K$ d) $10^3\ K$

421. The ratio of molecular mass of two radioactive substances is 3/2 and the ratio of their decay constants is 4/3. Then, the ratio of their initial activity per mole will be
a) 2 b) 4/3 c) $\frac{8}{9}$ d) 9/8

422. In half life of a radio isotope is 2 seconds and number of atoms are only 4, then after one half life remaining (without decay) atoms are probably
a) 1 b) 2 c) 3 d) All the above

423. When a radioactive isotope $_{88}R^{228}$decay in series by the emission of 3α-particles and β-particle, the isotope finally formed is
a) $_{84}X^{228}$ b) $_{86}X^{222}$ c) $_{83}X^{216}$ d) $_{83}X^{215}$

424. A radioactive substance has a half-life of 1 $year$. The fraction of this material, that would remain after 5 $years$ will be
a) $\frac{1}{32}$ b) $\frac{1}{5}$ c) $\frac{1}{2}$ d) $\frac{4}{5}$

425. 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) ^{235}U breaks up into fragments when bombarded by slow neutrons
d) ^{235}U is an unstable isotope and undergoes spontaneous fission

426. Minimum excitation potential of Bohr's first orbit in hydrogen atom is
a) 13.6 V b) 3.4 V c) 10.2 V d) 3.6 V

427. 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) $M + Z$

428. If an electron and a positron annihilate, then the energy released is
a) $3.2 \times 10^{-13} J$ b) $1.6 \times 10^{-13} J$ c) $4.8 \times 10^{-13} J$ d) $6.4 \times 10^{-13} J$

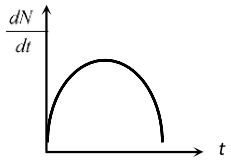
429. In any fission process the ratio $\frac{\text{mass of fission products}}{\text{mass of parent nucleus}}$ is
a) Less than 1 b) greater than 1
c) Equal to 1 d) Depends on the mass of parent nucleus

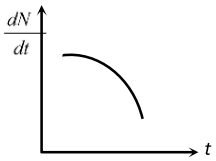
430. A common example of β-decay is
$_{15}P^{32} \rightarrow {}_{16}P^{32} + x + y$
Then x and y stand for

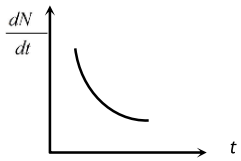
a) Electron and neutrino
b) Positron and neutrino
c) Electron and antineutrino
d) Positron and antineutrino

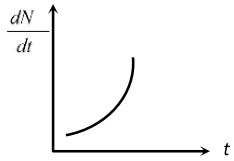
431. The radioactive nucleus ${}_7N^{13}$ decays to ${}_6C^{13}$ through the emission of
a) Neutron b) Proton c) Electron d) Positron

432. 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

a) 

b) 

c) 

d) 

433. The ionisation energy of 10 times ionised sodium atom is
a) 13.6 eV b) 13.6×11 eV c) $\frac{13.6}{11} eV$ d) $13.6 \times (11)^2 eV$

434. Calculate the energy released when three $\alpha -$ particles combined to from a ^{12}C nucleus , the mass defect is (atomic mass of ${}_2He^4$ is 4.002603 u)
a) 0.007809 u b) 0.002603 u c) 4.002603 u d) 0.5 u

435. The density of uranium is of the order of
a) 10^{20} kgm^{-3} b) 10^{17} kgm^{-3} c) 10^{14} kgm^{-3} d) 10^{11} kgm^{-3}

436. The half-life period of radium is 1600 $years$. Its average life time will be
a) 3200 $years$ b) 4800 $years$ c) 2319 $years$ d) 4217 $years$

437. Radioactive substances do not emit
a) Electron b) Helium nucleus c) Positron d) Proton

438. In nuclear reaction ${}_2He^4 + {}_zX^A \rightarrow {}_{z+2}Y^{A+3} + A, A$ denotes
a) Electron b) Positron c) Proton d) Neutron

439. 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
a) 0.026 MeV b) 0.051 MeV c) 0.079 MeV d) 0.105 MeV

440. Neutrino emission in $\beta -$ decay was predicted theoretically by
a) Planck b) Heisenberg c) Laue d) Pauli

441. The masses of neutron and proton are 1.0087 $a.m.u.$ and 1.0073 $a.m.u.$ respectively. If the neutrons and protons combine to form a helium nucleus (alpha particles) of mass 4.0015 $a.m.u.$ the binding energy of the helium nucleus will be $(1\ a.m.u. = 931\ MeV)$
a) 28.4 MeV b) 20.8 MeV c) 27.3 MeV d) 14.2 MeV

442. Most suitable element for nuclear fission is the element with atomic number near
a) 11 b) 21 c) 52 d) 92

443. The energy released in a typical nuclear fusion reaction is approximately
a) 25 MeV b) 200 MeV c) 800 MeV d) 1050 MeV

444. 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

445. The radioactive decay of uranium into thorium is expressed by the equation ${}^{238}_{92}U \rightarrow {}^{234}_{90}Th + X$, where '$X$' is
a) An electron b) A proton c) A deuteron d) An alpha particle

446. In the nuclear reaction
${}^{14}_{7}\text{N} + X \rightarrow {}^{14}_{6}\text{C} + {}^{1}_{1}\text{H}$, the X will be
a) ${}^{0}_{-1}\text{e}$ b) ${}^{1}_{1}\text{H}$ c) ${}^{2}_{1}\text{H}$ d) ${}^{1}_{0}n$

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

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

448. What will be ratio of radii of Li^7 nucleus to Fe^{56} nucleus?
a) 1:3 b) 1:2 c) 1:8 d) 2:6

449. If the energy released in the fission of one nucleus is 200 MeV then the number of nuclei required per second in a power plant of 16 kW will be
a) 0.5×10^{14} b) 0.5×10^{12} c) 5×10^{12} d) 5×10^{14}

450. Ionization energy of hydrogen is 13.6 eV. If $h = 6.6 \times 10^{-34} J - s$, the value of R will be of the order of
a) $10^{10} m^{-1}$ b) $10^{7} m^{-1}$ c) $10^{4} m^{-1}$ d) $10^{-7} m^{-1}$

451. Nucleus of an atom whose atomic mass is 24 consists of
a) 11 electrons, 11 protons and 13 neutrons b) 11 electrons, 13 protons and 11 neutrons
c) 11 protons and 13 neutrons d) 11 protons and 13 electrons

452. The control rod in a nuclear reactor is made of
a) Uranium b) Cadmium c) Graphite d) Plutonium

453. 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

454. A radioactive substance emits
a) α-rays b) β-rays c) γ-rays d) All of these

455. After two hours, one-sixteenth of the starting amount of a certain radioactive isotope remained undecayed. The half life of the isotope is
a) 15 $minutes$ b) 30 $minutes$ c) 45 $minutes$ d) 1 $hour$

456. Energy released in fusion of 1 kg of deuterium nuclei
a) $8 \times 10^{13} J$ b) $6 \times 10^{27} J$ c) $2 \times 10^{7} kwh$ d) $8 \times 10^{23} MeV$

457. An electron of a stationary hydrogen atom passes from the fifth energy level to the ground level. The velocity that the atom acquired as a result of photon emission will be
a) $24hR/25m$ b) $25hR/24m$ c) $25m/24hR$ d) $24m/25hR$

458. The mass defect in particular nuclear reaction if 0.3 g. The amount of energy liberated in kilowatt hour is (Velocity of light= 3×10^8 ms^{-1})
a) 1.5×10^6 b) 2.5×10^6 c) 3×10^6 d) 7.5×10^6

459. Alpha rays emitted from a radioactive substance are
a) Negatively charged particles
b) Ionized hydrogen nuclei
c) Doubly ionized helium atom
d) Unchanged particles having the mass equal to proton

460. An electron of an atom transits from n_1 to n_2. In which of the following maximum frequency of photon will be emitted
a) $n_1 = 1$ to $n_2 = 2$ b) $n_1 = 2$ to $n_2 = 1$ c) $n_1 = 2$ to $n_2 = 6$ d) $n_1 = 6$ to $n_2 = 2$

461. 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 each 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:
a) I and II b) I, III and IV c) I, II and III d) II and III

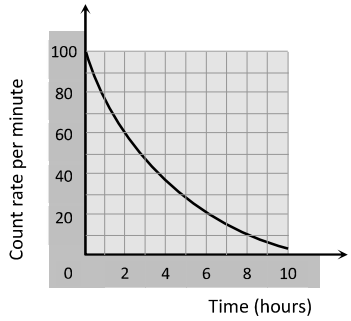
462. Which of the transitions in hydrogen atom emits a photon of lowest frequency (n = quantum number)
a) $n = 2$ to $n = 1$ b) $n = 4$ to $n = 3$ c) $n = 3$ to $n = 1$ d) $n = 4$ to $n = 2$

463. The force acting between proton and proton inside the nucleus is
a) Coulombic b) Nuclear c) Both d) None of these

464. The rest energy of an electron is

a) 510 KeV b) 931 KeV c) 510 MeV d) 931 MeV

465. The count rate of $10g$ 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



a) $4h, 9000$ b) $3h, 14000$ c) $3h, 235$ d) $3h, 50$

466. In a radioactive reaction

$$_{92}X^{232} \rightarrow {}_{82}X^{204}$$

the number of α-particles emitted is

a) 7 b) 6 c) 5 d) 4

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

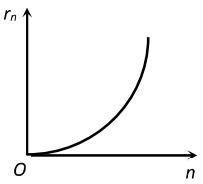
a) 69.3% b) 63% c) 50% d) 37%

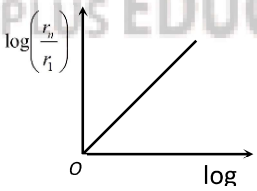
468. β-decay means emission of electron from

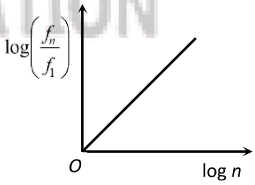
a) Innermost electron orbit b) A stable nucleus

c) Outermost electron orbit d) Radioactive nucleus

469. If in hydrogen atom, radius of n^{th} Bohr orbit is r_n, frequency of revolution of electron in n^{th} orbit is f_n, choose the correct option

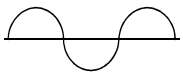
a) 

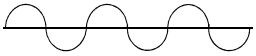
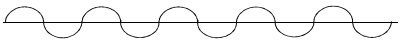
b) 

c) 

d) Both (a) and (b)

470. The de Broglie wave present in fifth Bohr orbit is

a)  b) 

c)  d) 

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

a) 6.62 yr b) 5 yr c) 3.2 yr d) 7yr

472. The electric potential between a proton and an electron is given by $V = V_0 \ln\frac{r}{r_0}$, where r_0 is a constant. Assuming Bohr's model to be applicable, write variation of r_n with n, n being the principal quantum number

a) $r_n \propto n$ b) $r_n \propto 1/n$ c) $r_n \propto n^2$ d) $r_n \propto 1/n^2$

473. Energy released in the fission of a single nucleus is 200MeV. The fission rate of a $^{235}_{92}$U filled reactor operating at a power level of 5W is

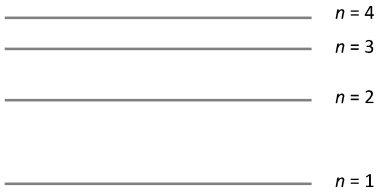
a) $1.56 \times 10^{-10}\text{s}^{-1}$ b) $1.56 \times 10^{11}\text{s}^{-1}$ c) $1.56 \times 10^{-16}\text{s}^{-1}$ d) $1.56 \times 10^{-17}\text{s}^{-1}$

474. The ratio of the kinetic energy to the total energy of an electron in a Bohr orbit is

a) -1 b) 2 c) 1 : 2 d) None of these

475. A radioactive element ${}_{90}X^{238}$ decays into ${}_{83}Y^{222}$. The number of β −particles emitted are
a) 4 b) 6 c) 2 d) 1

476. Four lowest energy levels of H-atom are shown in the figure. The number of possible emission lines would be



a) 3 b) 4 c) 5 d) 6

477. Ionisation energy of an electron present in the second Bohr's orbit of hydrogen is
a) 54.4 eV b) 13.6 eV c) 1.5 eV d) 3.4 eV

478. What percentage of original radioactive atoms is left after five half lives
a) 0.3% b) 1% c) 31% d) 3.125%

479. In a nuclear reactor, the fuel is consumed at the rate of 1 mgs^{-1}. The power generated in kilowatt is
a) 9×10^4 b) 9×10^7 c) 9×10^8 d) 9×10^{12}

480. An electron passing through a potential difference of 4.9 V collides with a memory atom and transfers it to the first excited state. What is the wavelength of a photon corresponding to the transition of the mercury atom to its normal state
a) 2050 Å b) 2240 Å c) 2525 Å d) 2935 Å

481. The mass number of a nucleus is 216. The size of an atom without changing its chemical properties are called
a) 7.2×10^{-13}cm b) 7.2×10^{-11}cm c) 7.2×10^{-10}cm d) 3.6×10^{-11}cm

482. A radioactive nucleus with Z protons and N neutrons emits an α-particle, 2β-particles and 2 gamma rays. The number of protons and neutrons in the nucleus left after the decay respectively, are
a) $Z-3, N-1$ b) $Z-2, N-2$ c) $Z-1, N-3$ d) $Z, N-4$

483. A sample contains 16 g 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) $\frac{1}{4}g$ c) $\frac{1}{2}g$ d) $1g$

484. A radioactive nucleus emits a beta particle. The parent and daughter nuclei are
a) Isotopes b) Isotones c) Isomers d) Isobars

485. The electron in the hydrogen atom jumps from excited state ($n = 3$) to its ground state ($n = 1$) and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 5.1 eV, the stopping potential is estimated to be (the energy of the electron in n^{th} state $E_n = -\frac{13.6}{n^2}eV$)
a) 5.1 V b) 12.1 V c) 17.2 V d) 7 V

486. Nucleus produced due to α-decay of the nucleus ${}_ZX^A$ is
a) ${}_{Z+2}Y^{A+4}$ b) ${}_ZY^A$ c) ${}_{Z-2}Y^{A-4}$ d) ${}_{Z-4}Y^{A-2}$

487. Hydrogen bomb is based upon
a) Fission b) fusion c) Chemical reaction d) Transmutation

488. Radius of the first orbit of the electron in a hydrogen atom is 0.53 Å. So, the radius of the third orbit will be
a) 2.12 Å b) 4.77 Å c) 1.06 Å d) 1.59 Å

489. C^{14} has half-life 5700 year. At the end of 11400 years, the actual amount left is
a) 0.5 of original amount b) 0.25 of original amount
c) 0.125 of original amount d) 0.0625 of original amount

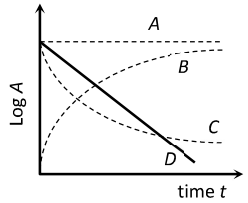
490. Radioactive nuclei that are injected into a patient collect at certain sites within its body, undergoing radioactive decay and emitting electromagnetic radiation. These radiations can then be recorded by a detector. This procedure provides an important diagnostic tool called

a) Gamma camera
b) CAT scan
c) Radiotracer technique
d) Gamma ray spectroscopy

491. According to the Rutherford's atomic model, the electrons inside the atom are
a) Stationary
b) Not stationary
c) Centralized
d) None of these

492. The frequency of 1st line of Balmer series in H_2 atom is v_0. The frequency of line emitted by singly ionized He atom is
a) $2v_0$
b) $4v_0$
c) $v_0/2$
d) $v_0/4$

493. The graph which represents the correct variation of logarithm of activity ($\log A$) versus time, in figure is



a) A
b) B
c) C
d) D

494. 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

495. For a radioactive nucleus, the mean life is T, If the number of decays per unit time is n at $t = 0$, the number of decays between time 0 and t, is
a) $nTe^{-t/T}$
b) $n(1 - e^{-t/T})$
c) $nT(1 - e^{-t/T})$
d) $ne^{-t/T}$

496. Sun energy is due to
a) Fission of hydrogen
b) Fusion of hydrogen
c) Both fission and fusion
d) Neither fusion nor fission

497. Mass of the nucleons together in a heavy nucleus is
a) Greater than mass of nucleus
b) Equal to mass of nucleus
c) Same as mass of nucleus
d) None of the above

498. The mass of a neutron is the same as that of
a) A proton
b) A meson
c) An epsilon
d) An electron

499. The spectral series of the hydrogen atom that lies in the visible region of the electromagnetic spectrum
a) Paschen
b) Balmer
c) Lyman
d) Brackett

500. Size of nucleus is of the order of
a) $10^{-10}m$
b) $10^{-15}m$
c) $10^{-12}m$
d) $10^{-19}m$

501. The wavelengths involved in the spectrum of deuterium (^2_1D) are slightly different from that of hydrogen spectrum, because
a) The attraction between the electron and the nucleus is different in the two cases
b) The size of the two nuclei are different
c) The nuclear forces are different in the two cases
d) The masses of the two nuclei are different

502. In Rutherford scattering experiment, what will be the correct angle for α scattering for an impact parameter $b = 0$
a) 90°
b) 270°
c) 0°
d) 180°

503. A radioactive nucleus undergoes α-emission to form a stable element. What will be the recoil velocity of the daughter nucleus if V is the velocity of α-emission and A is the atomic mass of radioactive nucleus
a) $\frac{4V}{A-4}$
b) $\frac{2V}{A-4}$
c) $\frac{4V}{A+4}$
d) $\frac{2V}{A+4}$

504. The ratio of the speed of the electrons in the ground state of hydrogen to the speed of light in vacuum is
a) 1/2
b) 2/137
c) 1/137
d) 1/237

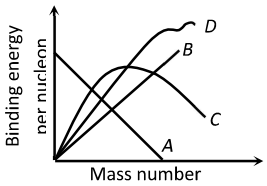
505. The sodium nucleus $^{23}_{11}Na$ contains
a) 11 electrons b) 12 protons c) 23 protons d) 12 neutrons

506. If a star can convert all the He nuclei completely into oxygen nuclei, the energy released per oxygen nuclei is (Mass of the nucleus is 4.0026 amu and mass of oxygen nucleus is 15.9994 amu)
a) 7.6MeV b) 56.12MeV c) 10.24MeV d) 23.9MeV

507. 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 $(t_1 - t_2)$
a) $A_1t_1 - A_2t_2$ b) $A_1 - A_2$ c) $(A_1 - A_2)/\lambda$ d) $\lambda(A_1 - A_2)$

508. Half life of Bi^{210} is 5 $days$. If we start with 50,000 atoms of this isotope, the number of atoms left over after 10 $days$ is
a) 5,000 b) 25,000 c) 12,500 d) 20,000

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



a) A b) B c) C d) D

510. 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 $4N_0$ 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
a) $\frac{5N_0}{2}$ b) $2N_0$ c) $3N_0$ d) $\frac{9N_0}{2}$

511. In which of the following systems will the radius of the first orbit $(n = 1)$ be minimum
a) Single ionized helium b) Deuterium atom
c) Hydrogen atom d) Doubly ionized lithium

512. The order of the size of nucleus and Bohr radius of an atom respectively are
a) $10^{-14}m, 10^{-10}m$ b) $10^{-10}m, 10^{-8}m$ c) $10^{-20}m, 10^{-16}m$ d) $10^{-8}m, 10^{-6}m$

513. Who discovered spin quantum number
a) Uhlenbeck & Goudsmit b) Niels's Bohr
c) Zeeman d) Sommerfeld

514. For the stability of any nucleus
a) Binding energy per nucleon will be more b) Binding energy per nucleon will be less
c) Number of electrons will be more d) None of the above

515. Energy required for the electron excitation in Li^{++} from the first to the third Bohr orbit is
a) 12.1 eV b) 36.3 eV c) 108.8 eV d) 122.4 eV

516. The curve of binding energy per nucleon as a function of a 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

517. Two radioactive substances A and B have decay constants 5λ and λ respectively. At $t = 0$ they have the same number of nuclei. The ratio of number of nuclei of A to those of B will be $\left(\frac{1}{e}\right)^2$ after a time interval
a) $\frac{1}{4\lambda}$ b) 4λ c) 2λ d) $\frac{1}{2\lambda}$

518. The electron in a hydrogen atom makes a transition $n_1 \rightarrow n_2$where $n_1$and n_2 are the principal quantum numbers of the two states. Assume the Bohr model to be valid. The time period of electron in the initial state is 8 times that in the final state. The possible values of n_1 and n_2 are
a) $n_1 = 6, n_2 = 3$ b) $n_1 = 8, n_2 = 2$ c) $n_1 = n_2 = 1$ d) $n_1 = 8, n_2 = 1$

519. Radium has a half-life of 5 yr. The probability of decay of a radium nucleus in 10 yr is
a) 50 % b) 75% c) 100% d) 60%

520. The ratio between total acceleration of the electron in singly ionized helium atom and hydrogen atom (both in ground state) is
a) 1 b) 8 c) 4 d) 16

521. If the ionization potential of helium atom is 24.6 $volt$, the energy required to ionize it will be
a) 24.6 eV b) 24.6 V c) 13.6 V d) 13.6 eV

522. Energy E of a hydrogen atom with principal quantum number n is given by $E = \frac{-13.6}{n^2} eV$. The energy of a photon ejected when the electron jumps from $n = 3$ state to $n = 2$ state of hydrogen is approximately
a) 1.5 eV b) 0.85 eV c) 3.4 eV d) 1.9 eV

523. For maintaining sustained chain reaction, the following is required
a) Protons b) electrons c) neutrons d) positons

524. The ratio of the radii of the nuclei ${}_{13}\mathrm{Al}^{27}$ and ${}_{52}\mathrm{Te}^{125}$ is approximately
a) 6: 10 b) 13: 52 c) 40: 17 d) 14: 73

525. The ratio of minimum wavelengths of Lyman and Balmer series will be
a) 5 b) 10 c) 1.25 d) 0.25

526. A radioactive material has a half life of 10 days. What fraction of the material would remain after 30 days
a) 0.5 b) 0.25 c) 0.125 d) 0.33

527. A radioactive nucleus (initial mass number A and atomic number Z) emits 3 $\alpha -$ particles and 2 positrons. The ratio of number of neutrons to that of protons in the final nucleus will be
a) $\frac{A-Z-8}{Z-4}$ b) $\frac{A-Z-4}{Z-8}$ c) $\frac{A-Z-12}{Z-4}$ d) $\frac{A-Z-4}{Z-2}$

528. Complete the equation for the following fission process ${}_{92}U^{235} + {}_{0}n^{1} \rightarrow {}_{38}Sr^{90} + \cdots$
a) ${}_{54}Xe^{143} + 3\,{}_{0}n^{1}$ b) ${}_{54}Xe^{145}$ c) ${}_{57}Xe^{142}$ d) ${}_{54}Xe^{142} + {}_{0}n^{1}$

529. At a given instant there are 25% undecayed radioactive nuclei. After 10 s the number of undecayed nuclei reduces to 6.25%, the mean life of the nuclei is
a) 14.43 s b) 7.21 s c) 5 s d) 10 s

530. When an electron in hydrogen atom is excited, from its 4^{th} to 5^{th} stationary orbit, the change in angular momentum of electron is (Planck's constant: $h = 6.6 \times 10^{-34} J\text{-}s$)
a) $4.16 \times 10^{-34} J\text{-}s$ b) $3.32 \times 10^{-34} J\text{-}s$ c) $1.05 \times 10^{-34} J\text{-}s$ d) $2.08 \times 10^{-34} J\text{-}s$

531. The binding energy of an electron in the ground state of He is equal to 24.6 eV. The energy required to remove both the electrons is
a) 49.2 eV b) 24.6 eV c) 38.2 eV d) 79.0 eV

532. The proper life of pion (π^+) is 2.5 $\times 10^{-8}$s. In a beam of pions travelling with a speed of 0.9 c, the pion, in the laboratory frame, can travel a maximum distance of
a) 6.75 m b) 15.49 m c) 7.50 m d) 17.10 m

533. A sodium atom is in one of the states labeled 'Lowest excited levels'. It remains in that state for an average time of $10^{-8} s$, before it makes a transition back to a ground state. What is the uncertainty in energy of that excited state
a) $6.56 \times 10^{-8} eV$ b) $2 \times 10^{-8} eV$ c) $10^{-8} eV$ d) $8 \times 10^{-8} eV$

534. If the binding energy per nucleon in ${}_{3}\mathrm{Li}^{7}$and ${}_{2}\mathrm{He}^{4}$nuclei are respectively 5.60 MeV and 7.06 MeV, then the energy of proton in the reaction ${}_{3}\mathrm{Li} + p \rightarrow 2\,{}_{2}\mathrm{He}^{4}$ is
a) 19.6 MeV b) 2.4 MeV c) 8.4 MeV d) 17.3 MeV

535. A radioactive isotope X with a half-life of 1.37×10^9 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 1:7. The age of the rock is

a) $1.96 \times 10^8 years$ b) $3.85 \times 10^9 years$ c) $4.11 \times 10^9 years$ d) $9.59 \times 10^9 years$

536. In which radioactive disintegration, neutron dissociates into proton and electron

a) He^{+1} emission b) β −emission c) γ −emission d) Positron emission

537. The half-life period of a radioactive element X is same as the mean life time of another radioactive element Y. Initially they have the same number of atoms. Then

a) X will decay faster than Y b) Y will decay faster than X

c) Y and X have same decay rate initially d) X and Y decay at same rate always.

538. Using the following data

Mass hydrogen atom = 1.00783 u

Mass of neutron = 1.00867 u

Mass of nitrogen atom ($_7N^{14}$)= 14.00307 u

The calculated value of the binding energy of the nucleus of the nitrogen atom ($_7N^{14}$) is close to

a) 56 MeV b) 98 MeV c) 104 MeV d) 112 MeV

539. Consider an electron ($m = 9.1 \times 10^{-31} kg$) confined by electrical forces to move between two rigid walls separated by $1.0 \times 10^{-9} metre$, which is about five atomic diameters. The quantized energy value for the lowest stationary state is

a) $12 \times 10^{-20} joule$ b) $6.0 \times 10^{-20} joule$ c) $6.0 \times 10^{-18} joule$ d) $6\ joule$

540. v_1 is the frequency of the series limit of Lyman series, v_2 is the frequency of the first line of Lyman series and v_3 is the frequency of the series limit of the Balmer series. Then

a) $v_1 - v_2 = v_3$ b) $v_1 = v_2 - v_3$ c) $\frac{1}{v_2} = \frac{1}{v_1} + \frac{1}{v_3}$ d) $\frac{1}{v_1} = \frac{1}{v_2} + \frac{1}{v_3}$

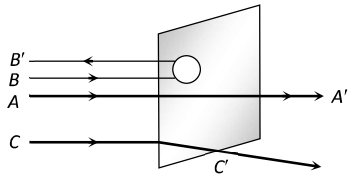
541. The splitting of line into groups under the effect of magnetic field is called

a) Zeeman's effect b) Bohr's effect c) Heisenberg's effect d) Magnetic effect

542. Mean life of a radioactive sample is 100 s. Then its half-life(in minutes) is

a) 0.693 b) 1 c) 10^{-4} d) 1.155

543. A beam of fast moving alpha particles were directed towards a thin film of gold. The parts A', B' and C' of the transmitted and reflected beams corresponding to the incident parts A, B and C of the beam, are shown in the adjoining diagram. The number of alpha particles in



a) B' will be minimum and in C' maximum b) A' will be maximum and in B' minimum

c) A' will be minimum and in B' maximum d) C' will be minimum and in B' maximum

544. In a fission reaction $_{92}U^{236} = X^{117} + Y^{117} + n + n$, 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

a) 200 keV b) 2 MeV c) 200 MeV d) 2000 MeV

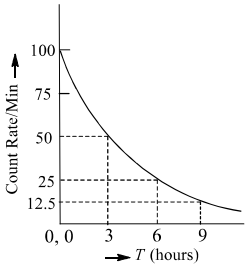
545. The half-life of a radioactive element is 3.8 days. The fraction left after 19 days will be

a) 0.124 b) 0.062 c) 0.093 d) 0.031

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

a) 15/16 b) 1/2 c) 2/1 d) None of these

547. The count rate for 10g of radioactive material was measured at different times and this has been shown in figure with scale given. The half-life of the material and the total count in the first half value period, respectively are



a) 4 h and 9000 (approximately) b) 3 h and 14100 (approximately)
c) 3 h and 235 (approximately) d) 10 h and 157 (approximately)

548. The electron in a hydrogen atom makes a transition from $n = n_1$ to $n = n_2$ state. The time period of the electron in the initial state is eight times that in the final state. The possible values of n_1 and n_2 are
a) $n_1 = 6, n_2 = 2$ b) $n_1 = 2, n_2 = 1$ c) $n_1 = 8, n_2 = 2$ d) $n_1 = 4, n_2 = 2$

549. The first member of the Paschen series in hydrogen spectrum is of wavelength 18,800 Å. The short wavelength limit of Paschen series is
a) 1215 Å b) 6560 Å c) 8225 Å d) 12850 Å

550. The wavelength of yellow line of sodium is 5896Å. Its wave number will be
a) 50883×10^{10} per second b) 16961 per cm
c) 17581 per cm d) 50883 per cm

551. A radioactive sample at any instant has its disintegration rate 5000 disintegrations per minute. After 5 min, the rate is 1250 disintegrations per min. Then, the decay constant (per minute) is
a) 0.4 In 2 b) 0.2 In 2 c) 0.1 In 2 d) 0.8 In 2

552. Nuclear fission experiments show that the neutrons split the uranium nuclei into two fragments of about same size. This process is accompanised by the emission of several
a) Protons and positrons b) α-particles
c) Neutrons d) Protons and α-particles

553. If 10% of a radioactive material decays in 5 days, then the amount of original material left after 20 days is approximately
a) 60% b) 65% c) 70% d) 75%

554. Half-life of a radioactive substance is 20 $minutes$. Difference between points of time when it is 33% disintegrated and 67% disintegrated is approximately
a) 10 min b) 20 min c) 30 min d) 40 min

555. During mean life of a radioactive element, the fraction that disintegrates is
a) e b) $\frac{1}{e}$ c) $\frac{e-1}{e}$ d) $\frac{e}{e-1}$

556. The ratio of areas within the electron orbits for the first excited state to the ground state for hydrogen atom is
a) 16 : 1 b) 18 : 1 c) 4 : 1 d) 2 : 1

557. Pick out the incorrect statement from the following
a) β-emission from the nucleus is always accompanied with a neutrino
b) The energy of the α-particle emitted from a given nucleus is always constant
c) γ-ray emission makes the nucleus more stable
d) Nuclear force is charge-independent

558. Best neutron moderator is
a) Beryllium oxide b) Pure water c) Heavy water d) Graphite

559. 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) $_7N^{16}$

560. Half-life of radium is 1600 yr. Its average life is
a) 3200 yr b) 4800 yr c) 2309 yr d) 4217 yr

561. Ionisation potential of hydrogen atom is 13.6 eV. Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy 12.1eV. The spectral lines emitted by hydrogen atoms according to Bohr's theory will be
a) One b) Two c) Three d) Four

562. If the nuclear radius of ^{27}Al is 3.6 Fermi, the approximate nuclear radius of ^{64}Cu in Fermi is
a) 2.4 b) 1.2 c) 4.8 d) 3.6

563. 3.8 days is the half-life period of a sample. After how many days, the sample will become 1/8th of the original substance
a) 11.4 b) 3.8 c) 3 d) None of these

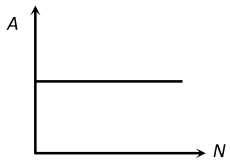
564. When a hydrogen atom is raised from the ground state to an excited state
a) P.E. increases and K.E. decreases
b) P.E. decreases and K.E. increases
c) Both kinetic energy and potential energy increase
d) Both K.E. and P.E. decrease

565. Which of the following has the mass closest in value to that of the positron $(1\ a.m.u = 931\ MeV)$
a) Proton b) Electron c) Photon d) Neutrino

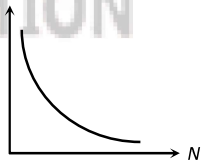
566. An α-particle of 5 MeV energy strikes with a nucleus of uranium at stationary at an scattering angle of 180°. The nearest distance upto which α-particle reaches the nucleus will be of the order of
a) 1 Å b) $10^{-10}cm$ c) $10^{-12}cm$ d) $10^{-15}cm$

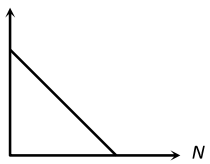
567. Orbital acceleration of electron is
a) $\frac{n^2h^2}{4\pi^2m^2r^3}$ b) $\frac{n^2h^2}{2n^2r^3}$ c) $\frac{4n^2h^2}{\pi^2m^2n^3}$ d) $\frac{4n^2h^2}{4\pi^2m^2r^3}$

568. The rate of disintegration was observed to be 10^{17} disintegrations per sec when its half life period is 1445 years. The original number of particles are
a) 8.9×10^{27} b) 6.6×10^{27} c) 1.4×10^{16} d) 1.2×10^{17}

569. The curve between the activity A of a radioactive sample and the number of active atoms N is
a) 

b) 

c) 

d) 

570. Atom bomb consists of two pieces of $_{92}U^{235}$ and a source of
a) Proton b) Neutron c) Meson d) Electron

571. An ionic atom equivalent to hydrogen atom has wavelength equal to 1/4 of the wavelength of hydrogen lines. The ion will be
a) He^+ b) Li^{++} c) Ne^{9+} d) Na^{10+}

572. 10 g 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

573. 1 g of hydrogen is converted into 0.993 g of helium in a thermonuclear reaction. The energy released is
a) $63 \times 10^7 J$ b) $63 \times 10^{10} J$ c) $63 \times 10^{14} J$ d) $63 \times 10^{20} J$

574. $_1H^1 + {}_1H^1 + {}_1H^2 \rightarrow X + {}_{+1}e^0 +$ energy. The emitted particle is
a) Neutron b) Proton c) α −particle d) Neutrino

575. Which of the following particle has similar mass to electron
a) Proton b) Neutron c) Positron d) Neutrino

576. Isotopes are atoms having
a) Same number of protons but different number of neutrons
b) Same number of neutrons but different number of protons
c) Same number of protons and neutrons

d) None of the above

577. Select the wrong statement
   a) Radioactivity is a statistical process.
   b) Radioactivity is a spontaneous process.
   c) Radioactivity is neutral characteristic of few elements.
   d) Radioactive elements cannot be produced in the laboratory.

578. The principle of controlled chain reaction is used in
   a) Atomic energy reactor
   b) Atom bomb
   c) In the core of sun
   d) Artificial radioactivity

579. Imagine an atom made up of a proton and a hypothetical particle of double the mass of the electron but having the same charge as the electron. Apply the Bohr's atom model and consider all possible transitions of this hypothetical particle to the first excited level. The longest wavelength photon that will be emitted has wavelength λ (given in terms of the Rydberg constant R for the hydrogen atom) is equal to
   a) $9/(5R)$
   b) $36/(5R)$
   c) $18/(5R)$
   d) $4/R$

580. Excitation energy of a hydrogen like ion in its first excitation state is 40.8 eV. Energy needed to remove the electron from the ion in ground state is
   a) 54.4 eV
   b) 13.6 eV
   c) 40.8 eV
   d) 27.2 eV

581. Radon (Rn) decays into Polonium (Po) by emitting an 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
   a) 3.2×10^{10}
   b) 0.53×10^{10}
   c) 2.1×10^{10}
   d) 0.8×10^{10}

582. The radius of an electron orbit in a hydrogen atom is of the order of
   a) $10^{-8}m$
   b) $10^{-9}m$
   c) $10^{-11}m$
   d) $10^{-13}m$

583. Which of the following is a fusion reaction?
   a) ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^4$
   b) ${}_1H^2 + {}_1H^2 \rightarrow 2({}_1H^2)$
   c) ${}_1H^1 + {}_1H^1 \rightarrow {}_2H^4$
   d) ${}_1H^1 + {}_1H^2 \rightarrow {}_2H^4 + n$

584. 1 atomic mass unit is equal to
   a) $\frac{1}{25}$ (mass of F_2 molecule)
   b) $\frac{1}{14}$ (mass of N_2 molecule)
   c) $\frac{1}{12}$ (mass of one C-atom)
   d) $\frac{1}{16}$ (mass of O_2 molecule)

585. An atomic power nuclear reactor can deliver 300 MW. The energy released due to fission of each nucleus of uranium atom U^{238} is 170 MeV. The number of uranium atoms fissioned per hour will be
   a) 30×10^{25}
   b) 4×10^{22}
   c) 10×10^{20}
   d) 5×10^{15}

586. K_α and K_β X-rays are emitted when there is a transition of electron between the levels
   a) $n = 2$ to $n = 1$ and $n = 3$ to $n = 1$ respectively
   b) $n = 2$ to $n = 1$ and $n = 3$ to $n = 2$ respectively
   c) $n = 3$ to $n = 2$ and $n = 4$ to $n = 2$ respectively
   d) $n = 3$ to $n = 2$ and $n = 4$ to $n = 3$ respectively

587. Given a sample of $Radium$-226 having half-life of 4 days. Find the probability, a nucleus disintegrates after 2 half lives
   a) 1
   b) 1/2
   c) 1.5
   d) 3/4

588. In Bohr's model of hydrogen atom, which of the following pairs of quantities are quantized
   a) Energy and linear momentum
   b) Linear and angular momentum
   c) Energy and angular momentum
   d) None of the above

589. If r_1 and r_2 are the radii of the atomic nuclei of mass numbers 64 and 125 respectively, then the ratio (r_1/r_2) is
   a) $\frac{64}{125}$
   b) $\sqrt{\frac{64}{125}}$
   c) $\frac{5}{4}$
   d) $\frac{4}{5}$

590. Thermal neutrons can cause fission in

a) U^{235} b) U^{238} c) Pu^{238} d) Th^{232}

591. For electron moving in n^{th} orbit of H-atom the angular velocity is proportional to
a) n b) $1/n$ c) n^3 d) $1/n^3$

592. The operation of a nuclear reactor is said to be critical, if the multiplication factor (k) has a value
a) 1 b) 1.5 c) 2.1 d) 2.5

593. The mass number of nucleus is
a) Sometimes equal to its atomic number
b) Sometimes less than and sometimes more than its atomic number
c) Always less than its atomic number
d) Always more than its atomic number

594. The subatomic particles proton and neutron fall under the group of
a) Mesons b) Photons c) Leptons d) Baryons

595. The half -life period of a radioactive substance is 3 days. Three fourth of substance decays in
a) 3 days b) 6 days c) 9 days d) 12 days

596. According to the quark model, it is possible to build all the hadrons using
a) 2 quarks and 3 antiquarks b) 3 quarks and 2 antiquarks
c) 3 quarks and 3 antiquarks d) 2 quarks and 2 antiquarks

597. $_7N^{14}$ is bombarded with $_2\text{He}^4$. The resulting nucleus is $_8\text{O}^{17}$ with the emission of
a) Neutrino b) Antineutrino c) Proton d) Neutron

598. If electron in a hydrogen atom has moved from $n = 1$ to $n = 10$ orbit, the potential energy of the system has
a) Increased b) Decreased c) Remained unchanged d) Become zero

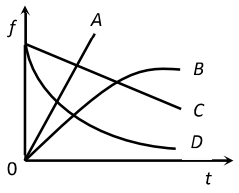
599. The ionization energy of the electron in the hydrogen atom in its ground state is 13.6 eV. The atoms are excited to higher energy levels to emit radiations of 6 wavelengths. Maximum wavelength of emitted radiation corresponds to the transition between
a) $n = 3$ to $n = 2$ states b) $n = 3$ to $n = 1$ states c) $n = 2$ to $n = 1$ states d) $n = 4$ to $n = 3$ states

600. Which of the following is most unstable
a) Electrons b) Protons c) Neutrons d) α-particle

601. For ionizing an excited hydrogen atom, the energy required (in eV) will be
a) A little less then 13.6 b) 13.6 c) More than 13.6 d) 3.4 or less

602. First Bohr radius of an atom with $Z = 82$ is R. Radius of its third orbit is
a) $9R$ b) $6R$ c) $3R$ d) R

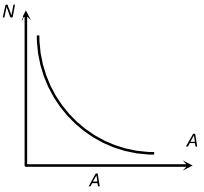
603. The fraction f of radioactive material that has decayed in time t, varies with time t. The correct variation is given by the curve

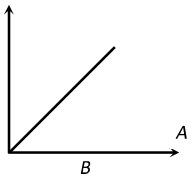


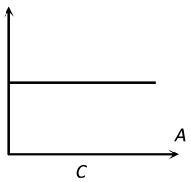
a) A b) B c) C d) D

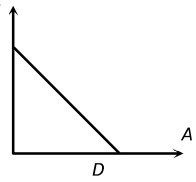
604. The energy of electron in the nth orbit of hydrogen atom is expressed as $E_n = \frac{-13.6}{n^2} eV$. The shortest and longest wavelength of Lyman series will be
a) 910Å, 1213Å b) 5463Å, 7858Å c) 1315Å, 1530Å d) None of these

605. The plot of the number (N) of decayed atoms versus activity (A) of a radioactive substance is

a) 

b) 

c) 

d) 

606. The ratio of half-life times of two elements A and B is $\frac{T_A}{T_B}$. The ratio of respectively decay constants $\frac{\lambda_A}{\lambda_B}$ is
a) $\frac{T_B}{T_A}$ b) $\frac{T_A}{T_B}$ c) $\frac{T_A + T_B}{T_A}$ d) $\frac{T_A - T_B}{T_A}$

607. The wavelength of Lyman series is
a) $\frac{4}{3 \times 10967} cm$ b) $\frac{3}{4 \times 10967} cm$ c) $\frac{4 \times 10967}{3} cm$ d) $\frac{3}{4} \times 10967 cm$

608. Fusion reaction takes place at high temperature because
a) KE is high enough to overcome repulsion between nuclei
b) nuclei are most stable at this temperature
c) nuclei are unstable at this temperature
d) None of the above

609. A radioactive sample of U^{238} decays to Pb through a process for which half life is $4.5 \times 10^9 years$. The ratio of number of nuclei of Pb to U^{238} after a time of $1.5 \times 10^9 years$ (given $2^{1/3} = 1.26$)
a) 0.12 b) 0.26 c) 1.2 d) 0.37

610. The mass defect for the nucleus of helium is 0.0303 $a.m.u$. What is the binding energy per nucleon for helium in MeV
a) 28 b) 7 c) 4 d) 1

611. The energy in MeV is released due to transformation of 1 kg mass completely into energy ($c = 3 \times 10^8 m/s$)
a) $7.625 \times 10\ MeV$ b) $10.5 \times 10^{29}\ MeV$ c) $2.8 \times 10^{-28}\ MeV$ d) $5.625 \times 10^{29}\ MeV$

612. Which of the following statements are true regarding Bohr's model of hydrogen atom
(I) Orbiting speed of electron decreases as it shifts to discrete orbits away from the nucleus
(II) Radii of allowed orbits of electron are proportional to the principal quantum number
(III) Frequency with which electrons orbit around the nucleus is discrete orbits is inversely proportional to the cube of principal quantum number
(IV) Binding force with which the electron is bound to the nucleus increases as it shifts to outer orbits
Select correct answer using the codes given below
a) I and III b) II and IV c) I, II and III d) II, III and IV

613. As compound ^{12}C atom, ^{14}C atom has
a) Two extra protons and two extra electrons
b) Two extra protons but no extra electrons
c) Two extra neutrons and no extra electrons
d) Two extra neutrons and two extra electrons

614. Consider a hypothetical annihilation of a stationary electron with a stationary positron. What is the wavelength of resulting radiation
(h = Planck's constant, c = speed of light, m_0 = rest mass)
a) $\frac{h}{2m_0c}$ b) $\frac{h}{m_0c}$ c) $\frac{2h}{m_0c}$ d) $\frac{h}{m_0c^2}$

615. A radioactive substance of half-life 6 min is placed near a Geiger counter which is found to resister 1024 particles per minute. How many particles per minute will it register after 42 min?
a) 4 per min b) 8 per min c) 5 per min d) 7 per min

616. There are two radioactive substances A and B. Decay constant of B is two times that of A. Initially, both have equal number of nuclei. After n half lives of A, rate of disintegration of both are equal. The value of n is
a) 4 b) 2 c) 1 d) 5

617. Nuclear fission was discovered by
a) Ottohann and F. Strassmann b) Fermi
c) Bethe d) Rutherford

618. The third line of Balmer series of an ion equivalent to hydrogen atom has wavelength of 108.5 nm. The ground state energy of an electron of this ion will be
a) 3.4 eV b) 13.6 eV c) 54.4 eV d) 122.4 eV

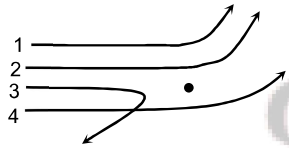
619. Li nucleus has three protons and four neutrons. Mass of lithium nucleus is 7.016005 amu. Mass of proton is 1.007277 amu and mass of neutron is 1.008665 amu. Mass defect for lithium nucleus in amu is
a) 0.04048 amu b) 0.04050 amu c) 0.04052 amu d) 0.04055 amu

620. The average binding energy per nucleon in the nucleus of an atom is approximately
a) 8 eV b) 8 KeV c) 8 MeV d) 8 J

621. ${}_2^4\mathrm{He} + {}_4^9\mathrm{Be} \rightarrow {}_0^1n +$?
The missing ion in the above nuclear reaction is
a) proton b) Oxygen-12 c) Carbon-12 d) Nitrogen-12

622. Every series of hydrogen spectrum has an upper and lower limit in wavelength. The spectral series which has an upper limit of wavelength equal to 18752 Å is
(Rydberg constant $R = 1.097 \times 10^7\ per\ metre$)
a) Balmer series b) Lyman series c) Paschen series d) Pfund series

623. The diagram shows the path of four α-particles of the same energy being scattered by the nucleus of an atom simultaneously. Which of these are/is not physically possible



a) 3 and 4 b) 2 and 3 c) 1 and 4 d) 4 only

624. The binding energy of deuteron ${}_1^2H$ is 1.112 MeV per nucleon and an α-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

625. The ground state energy of hydrogen atom is $-13.6\ eV$. What is the potential energy of the electron in this state
a) 0 eV b) $-27.2\ eV$ c) 1 eV d) 2 eV

626. The penetrating powers of α, β and γ radiations, in decreasing order are
a) γ, α, β b) γ, β, α c) α, β, γ d) β, γ, α

627. The transition from the state $n = 4$ to $n = 3$ in a hydrogen like atom result in ultraviolet radiation. Infrared radiation will be obtained in the transition from
a) $2 \rightarrow 1$ b) $3 \rightarrow 2$ c) $4 \rightarrow 2$ d) $5 \rightarrow 4$

628. The Bohr model of atom
a) Assumes that the angular momentum of electrons is quantized
b) Uses Einstein's photo-electric equation
c) Predicts continuous emission spectra for atoms
d) Predicts the same emission spectral for all types of atoms

629. 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 $hours$

630. The de-Broglie wavelength of an electron in the first Bohr orbit is
a) Equal to one fourth the circumference of the first orbit

b) Equal to half the circumference of the first orbit
c) Equal to twice the circumference of the first orbit
d) Equal to the circumference of the first orbit

631. A particle moving with a velocity of $\frac{1}{100}$th of that of light will cross a nucleus on about
a) 10^{-8}s b) 10^{-12}s c) 6×10^{-15}s d) 10^{-20}s

632. In the nuclear reaction ${}_{85}X^{297} \rightarrow Y + 4\alpha, Y$ is
a) ${}_{76}Y^{287}$ b) ${}_{77}Y^{285}$ c) ${}_{77}Y^{281}$ d) ${}_{77}Y^{289}$

633. The energy released in the fission of 1Kg of ${}_{92}\mathrm{U}^{235}$ is (energy per fission =200 MeV)
a) 5.1×10^{26}eV b) 5.1×10^{26} J c) 8.2×10^{13} J d) 8.2×10^{13} MeV

634. A radioactive sample S1 having an activity of $5\mu Ci$ has twice the number of nuclei as another sample S2 which has an activity of $10\mu Ci$. The half lives of S1 and S2 can be
a) 20 years and 5 years, respectively b) 20 years and 10 years, respectively
c) 10 years each d) 5 years each

635. If M is the atomic mass and A is the mass number, packing fraction is given by
a) $\frac{M}{M-A}$ b) $\frac{M-A}{A}$ c) $\frac{A}{M-A}$ d) $\frac{A-M}{A}$

636. The radius of hydrogen atom in its ground state is $5.3 \times 10^{-11}m$. After collision with an electron it is found to have a radius of $21.2 \times 10^{-11}m$. What is the principal quantum number n of the final state of the atom
a) $n = 4$ b) $n = 2$ c) $n = 16$ d) $n = 3$

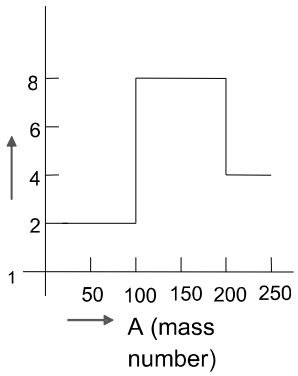
637. If half-life of a radioactive atom is 2.3 $days$, then its decay constant would be
a) 0.1 b) 0.2 c) 0.3 d) 2.3

638. Consider an initially pure $'M'g$ sample of ${}^{A}X$, an isotope that has a half life of T hour. What is it's initial decay rate (N_A = Avogrado No.)
a) $\frac{MN_A}{T}$ b) $\frac{0.693MN_A}{T}$ c) $\frac{0.693MN_A}{AT}$ d) $\frac{2.303MN_A}{AT}$

639. 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 ${}_1H^2 + {}_1H^2 \rightarrow {}_2 He^4 + Q$
a) $4(x_1 + x_2)$ b) $4(x_2 - x_1)$ c) $2(x_1 + x_2)$ d) $2(x_2 - x_1)$

640. In Bohr model of the hydrogen atom, the lowest orbit corresponds to
a) Infinite energy b) The maximum energy
c) The minimum energy d) Zero energy

641. Assume the graph of specific binding energy *verses* mass number is as shown in the figure. Using this graph, select the correct choice from the following.



a) Fusion of two nuclei of mass number lying in the range of $100 < A < 200$ will release energy.
b) Fusion of two nuclei of mass number lying in the range of $51 < A < 100$ will release energy.

c) Fusion of two nuclei of mass number lying in the range of $1 < A < 50$ will release energy.

d) Fusion of the nucleus of mass number lying in the range of $100 < A < 200$ will release energy when broken into two fragments.

642. When a neutron is disintegrated to give aβ particle,
a) A neutrino alone is emitted
b) A proton and neutrino are emitted
c) A proton alone is emitted
d) A proton and an antineutrino are emitted

643. 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 Å c) 5.9 pm d) 0.59 pm

644. Half-life of radioactive sample, when activity of material initially was 8 counts and after 3 h it becomes 1 count, is
a) 2h b) 1h c) 3h d) 4h

645. An artificial radioactive decay series begins with unstable $^{241}_{94}Pu$. The stable nuclide obtained after eight α −decays and five β −decays is
a) $^{209}_{83}Bi$ b) $^{209}_{82}Pb$ c) $^{205}_{82}Ti$ d) $^{201}_{82}Hg$

646. The activity of a radioactive element decreases to one-third of the original activity A_0 in a period of 9 yr. After a further lapes of 9 yr, its activity will be
a) A_0 b) $\frac{2}{3}A_0$ c) $\frac{A_0}{9}$ d) $\frac{A_0}{6}$

647. The set which represents the isotope, isobar and isotone respectively is
a) $(_1H^2, _1H^3), (_{79}Au^{197}, _{80}Hg^{198})$ and $(_2He^3, _1H^2)$ b) $(_2He^3, _1H^1), (_{79}Au^{197}, _{80}Hg^{198})$ and $(_1H^1, _1H^3)$
c) $(_2He^3, _1H^3), (_1H^2, _1H^3)$ and $(_{79}Au^{197}, _{80}Hg^{198})$ d) $(_1H^2, _1H^3), (_2He^3, _1H^3)$ and $(_{79}Au^{197}, _{80}Hg^{198})$

648. Nuclear fusion is common to the pair
a) Thermonuclear reactor, uranium based nuclear reactor
b) Energy production in sun, uranium based nuclear reactor
c) Energy production in sun, hydrogen bomb
d) Disintegration of heavy nuclei, hydrogen bomb

649. $^{232}_{90}Th$ an isotope of thorium decays in ten stages emitting six α-particles and four β-particles in all. The end product of the decay is
a) $^{206}_{82}Pb$ b) $^{209}_{82}Pb$ c) $^{208}_{82}Pb$ d) $^{209}_{83}Br$

650. An electron is
a) Hadron b) Baryon c) A nucleon d) A lepton

651. The energy released in the explosion of an atom bomb is mainly due to
a) nuclear fusion
b) nuclear fission
c) Controlled nuclear chain reaction
d) None of the above

652. 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

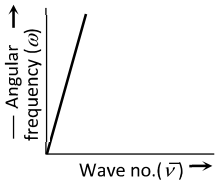
653. A nucleus ^A_ZX has mass represented by $M(A, Z)$. If M_P and M_n denote the mass of proton and neutron respectively and B.E the binding energy in MeV, then
a) $B.E. = [M(A,Z) - ZM_P - (A-Z)M_n]C^2$
b) $B.E. = [ZM_P + (A-Z)M_n - M(A.Z)C^2$
c) $B.E. = [ZM_P + AM_n - M(A.Z)]C^2$
d) $B.E. = M(A,Z) - ZM_P - (A-Z)M_n$

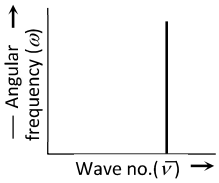
654. Consider the nuclear reaction $X^{200} \rightarrow A^{110} + B^{80}$. If the binding energy per nucleon for X, A and B are 7.4 MeV, 8.2 MeV and 8.1MeV respectively, then the energy released in the reaction is
a) 70 MeV b) 200 MeV c) 190 MeV d) 10 MeV

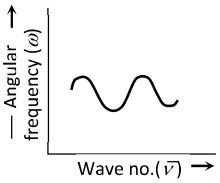
655. The time of revolution of an electron around a nucleus of charge Ze in n^{th} Bohr orbit is directly proportional to
a) n b) $\frac{n^3}{Z^2}$ c) $\frac{n^2}{Z}$ d) $\frac{Z}{n}$

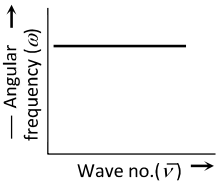
656. Which sample contains greater number of nuclei : a $5.00-\mu Ci$ sample of ^{240}Pu (half-life $6560y$) or a $4.45-\mu Ci$ sample of ^{243}Am (half-life $7370y$)
a) ^{240}Pu b) ^{243}Am c) Equal in both d) None of these

657. Heavy water is
a) Water is 4°C
b) Compound of deuterium and oxygen
c) Compound of heavy oxygen and heavy hydrogen
d) Water, in which soap does not lather

658. The graph between wave number ($\bar{\nu}$) and angular frequency (ω) is
a) 

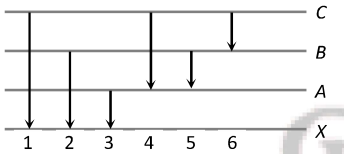
b) 

c) 

d) 

659. 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

660. The half-life of a radioactive substance against α-decay is $1.2\times10^{7}s$. What is the decay rate for 4×10^{15} atoms of the substance
a) $4.6\times10^{12}atoms/s$ b) $2.3\times10^{11}atoms/s$ c) $4.6\times10^{10}atoms/s$ d) $2.3\times10^{8}atoms/s$

661. The figure indicates the energy level diagram of an atom and the origin of six spectral lines in emission ($e.g.$ line no. 5 arises from the transition from level B to A). Which of the following spectral lines will also occur in the absorption spectra


a) 1, 4, 6 b) 4, 5, 6 c) 1, 2, 3 d) 1, 2, 3, 4, 5, 6

662. The mass and energy equivalent to 1 amu are respectively
a) $1.67\times10^{-27}gm, 9.30\ MeV$ b) $1.67\times10^{-27}kg, 930\ MeV$
c) $1.67\times10^{-27}kg, 1\ MeV$ d) $1.67\times10^{-34}kg, 1\ MeV$

663. Nuclear binding energy is equivalent to
a) Mass of proton b) Mass of neutron
c) Mass of nucleus d) Mass defect of nucleus

664. The difference between U^{235} and U^{238} atom is that
a) U^{238} contains 3 more protons
b) U^{238} contains 3 protons and 3 more electrons
c) U^{238} contains 3 more neutrons and 3 more electrons
d) U^{238} contains 3 more neutrons

665. The kinetic energy of electron in the first Bohr orbit of the hydrogen atom is
a) $-6.5\ eV$ b) $-27.2\ eV$ c) $13.6\ eV$ d) $-13.6\ eV$

666. If the wavelength of the first line of the Balmer series of hydrogen is 6561 Å, the wavelength of the second line of the series should be
a) 13122 Å b) 3280 Å c) 4860 Å d) 2187 Å

667. What is the particle x in the following nuclear reaction
$^{9}_{4}Be + {}^{4}_{2}He \rightarrow {}^{12}_{6}C + x$
a) Electron b) Proton c) Photon d) Neutron

668. In the options given below, let E denote the rest mass energy of a nucleus and n a neutron. the correct option is

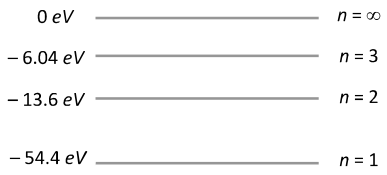
a) $E(^{236}_{92}U) > E(^{137}_{53}I) + E(^{97}_{39}Y) + 2E(n)$ b) $E(^{236}_{92}U) < E(^{137}_{53}I) + E(^{97}_{39}Y) + 2E(n)$

c) $E(^{236}_{92}U) > E(^{140}_{56}\text{Ba}) + E(^{94}_{36}\text{Kr}) + 2E(n)$ d) $E(^{236}_{92}U) < E(^{140}_{56}\text{Ba}) + E(^{94}_{36}\text{Kr}) + 2E(n)$

669. The wavelength of light emitted from second orbit to first orbits in a hydrogen atom is

a) $1.215 \times 10^{-7}m$ b) $1.215 \times 10^{-5}m$ c) $1.215 \times 10^{-4}m$ d) $1.215 \times 10^{-3}m$

670. The energy level diagram for an hydrogen like atom is shown in the figure. The radius of its first Bohr orbit is



a) 0.265 Å b) 0.53 Å c) 0.132 Å d) None of these

671. 99% of a radioactive element will decay between

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

672. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is

a) 122.4 eV b) 30.6 eV c) 13.6 eV d) 3.4 eV

673. A radioactive sample S_1 having an activity of 5μCi has twice the number of nuclei as another sample S_2 which has an activity of 10 μCi. The half lives of S_1 and S_2 can be

a) 20 yr and 5 yr ,respectively b) 20 yr and 10 yr ,respectively

c) 10 yr each d) 5 yr each

674. 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}

675. The speed of daughter nuclei is

a) $c\frac{\Delta m}{M+\Delta m}$ b) $c\sqrt{\frac{2\Delta m}{M}}$ c) $c\sqrt{\frac{\Delta m}{M}}$ d) $c\sqrt{\frac{\Delta m}{M+\Delta m}}$

676. The nucleus of atomic mass A and atomic number Z emits a β-particle. The atomic mass and atomic number of the resulting nucleus are

a) A, Z b) $A+1, Z$ c) $A, Z+1$ d) $A-4, Z-2$

677. A hypothetical radioactive nucleus decays according to the following series

$_{72}A^{180} \xrightarrow{\alpha} A_1 \xrightarrow{\beta^-} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$

If the mass number and atomic number of A are respectively 180 and72. Then to atomic number and mass number of A will respectively be

a) 69,171 b) 70,172 c) 68,172 d) 69,172

678. The transition from the state $n = 4$ to $n = 3$ in a hydrogen, like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition

a) $2 \to 1$ b) $3 \to 2$ c) $4 \to 2$ d) $5 \to 4$

679. After five half lives what will be the fraction of initial substance

a) $\left(\frac{1}{2}\right)^{10}$ b) $\left(\frac{1}{2}\right)^{5}$ c) $\left(\frac{1}{2}\right)^{4}$ d) $\left(\frac{1}{2}\right)^{3}$

680. In the given reaction $_ZX^A \to {}_{Z+1}Y^A \to {}_{Z-1}K^{A-4} \to {}_{Z-1}K^{A-4}$ radioactive radiation are emitted in the sequence

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

681. When $_{92}U^{235}$ undergoes fission, 0.1% of its original mass is changed into energy. How much energy is released if $1kg$ of $_{92}U^{235}$ undergoes fission

a) $9 \times 10^{10} J$ b) $9 \times 10^{11} J$ c) $9 \times 10^{12} J$ d) $9 \times 10^{13} J$

682. Antiparticle of electron is

a) ${}_0n^1$ b) ${}_1H^1$ c) Positron d) Neutrino

683. The ratio of speed of an electron in ground state in Bohrs first orbit of hydrogen atom to velocity of light in air is

a) $\frac{e^2}{2\varepsilon_0 hc}$ b) $\frac{2e^2\varepsilon_0}{hc}$ c) $\frac{e^3}{2\varepsilon_0 hc}$ d) $\frac{2\varepsilon_0 hc}{e^2}$

684. In a radioactive substance at $t = 0$, the number of atoms is 8×10^4. Its half life period is 3 $years$. The number of atoms 1×10^4 will remain after interval

a) 9 $years$ b) 8 $years$ c) 6 $years$ d) 24 $years$

685. Which of the following processes represents a γ-decay?

a) ${}_ZX^A + \gamma \longrightarrow_{(Z-1)} X^{A+a+b}$ b) ${}_ZX^A + {}_0n^1 \longrightarrow_{(Z-2)} X^{(A-3)} + C$

c) ${}_ZX^A \longrightarrow_Z X^A + \gamma$ d) ${}_ZX^A + {}_{-1}e^0 \longrightarrow {}_{A-1}X^{A+g}$

686. Heavy water is used in a nuclear reactor to

a) Absorb the neutrons b) Slow down the neutrons

c) Act as coolant d) None of the above

687. What is the radius of iodine atom (at. no. 53, mass number 126)

a) $2.5 \times 10^{-11} m$ b) $2.5 \times 10^{-9} m$ c) $7 \times 10^{-9} m$ d) $7 \times 10^{-6} m$

688. As per Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized Li atom ($Z = 3$) is

a) 1.51 b) 13.6 c) 40.8 d) 122.4

689. The first line in the Lyman series has wavelength λ. The wavelength of the first line in Balmer series is

a) $\frac{2}{9}\lambda$ b) $\frac{9}{2}\lambda$ c) $\frac{5}{27}\lambda$ d) $\frac{27}{5}\lambda$

690. The half-life of radioactive Polonium (Po) is 138.6 $days$. For ten lakh Polonium atoms, the number of disintegration in 24 hours is

a) 2000 b) 3000 c) 4000 d) 5000

691. A reaction between a proton and ${}_8O^{18}$ that produces ${}_9F^{18}$ must also liberate

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

692. After absorbing a slowly moving neutron of mass m_N (momentum ~0) a nucleus of mass M breaks into two nuclei of masses m_1 and $5m_1$ ($6m_1 = M + m_N$), respectively. If the de-Broglie wavelength of the nucleus with mass m_1 is λ, then de- Broglie wavelength of the other nucleus will be

a) 25λ b) 5λ c) $\frac{\lambda}{5}$ d) λ

693. A radioactive nucleus A finally transforms into a stable nucleus B. Then A and B can be

a) Isobars b) Isotones c) Isotopes d) None of these

694. 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) None of these

695. The rate of disintegration of fixed quantity of a radioactive element can be increased by

a) Increasing the temperature b) Increasing the pressure

c) Chemical reaction d) It is not possible

696. In the nuclear fusion reaction

${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{H}e + n$

given that the repulsive potential energy between the two nuclei is 7.7 $\times 10^{-14}$ J, the temperature at which the gases must be heated to initiate the reaction is nearly [Boltzmann's constant $k = 1.38 \times 10^{-23}$ JK^{-1}]

a) 10^7 K b) 10^5 K c) 10^3 K d) 10^9 K

697. 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*

698. Neutrons are used in nuclear fission, because
a) Neutrons are attracted by nucleus
b) Mass of neutrons is greater than protons
c) Neutrons are neutral and hence are not repelled by the nucleus
d) Neutrons could be accelerated to a greater energy

699. In the following transitions, which one has higher frequency
a) 3 – 2 b) 4 – 3 c) 4 – 2 d) 3 – 1

700. 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) $A = 238, Z = 90$

701. Curie is a unit of
a) Energy of gamma-rays b) Half-life
c) Radioactivity d) Intensity of gamma-rays

702. The radioactive nucleus of mass number A, initially at rest, emits an $\alpha -$ particle with a speed$v$. The recoil speed of the daughter nucleus will be
a) $\frac{2v}{A-4}$ b) $\frac{2v}{A+4}$ c) $\frac{4v}{A-4}$ d) $\frac{4v}{A+4}$

703. What was the fissionable material used in bomb dropped at Nagasaki (Japan) in the year 1945
a) Uranium b) Nepturium c) Berkelium d) Plutonium

704. Which of the following atoms has the lowest ionization potential
a) ${}_{8}^{16}O$ b) ${}_{7}^{14}N$ c) ${}_{55}^{133}Cs$ d) ${}_{18}^{40}Ar$

705. Consider the following two statements
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

706. In a hydrogen atom, which of the following electronic transitions would involve the maximum energy change
a) From $n = 2$ to $n = 1$ b) From $n = 3$ to $n = 1$ c) From $n = 4$ to $n = 2$ d) From $n = 3$ to $n = 2$

707. Two protons exert a nuclear force on each other, the distance between them is
a) $10^{-14}m$ b) $10^{-10}m$ c) $10^{-12}m$ d) $10^{-8}m$

708. The energy of a hydrogen atom in its ground state is $-13.6\ eV$. The energy of the level corresponding to the quantum number $n = 2$ (first excited state) in the hydrogen atom is
a) $-2.72\ eV$ b) $-0.85\ eV$ c) $-0.54\ eV$ d) $-3.4\ eV$

709. 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) $M(N,Z) = NM_n + ZM_p + B/c^2$

710. In a Rutherford scattering experiment when a projectile of charge z_1 and mass M_1 approaches a target nucleus of charge z_2 and mass M_2, the distance of closest approach is r_0. The energy of the projectile is
a) Directly proportional to $M_1 \times M_2$ b) Directly proportional to $z_1 z_2$
c) Inversely proportional to z_1 d) Directly proportional to mass M_1

711. A radioactive sample has 4×10^{10} nuclei at a certain time. The number of active nuclei still remaining after 4 half lives is
a) 1×10^{10} b) 5×10^{9} c) 25×10^{8} d) 5×10^{8}

712. The most stable particle in Baryon group is
a) Proton b) Lamda-particle c) Neutron d) Omega-particle

713. The average number of prompt neutrons produced per fission of U^{235} is
a) More than 5 b) 3 to 5 c) 2 to 3 d) 1 to 2

714. A gamma ray photon creates an electron-positron pair. If the rest mass energy of an electron is 0.5 MeV and the total K.E. of the electron-positron pair is 0.78 MeV, then the energy of the gamma ray photon must be
a) 0.78 MeV b) 1.78 MeV c) 1.28 MeV d) 0.28 MeV

715. Fission of nuclei is possible because the binding energy per nucleon in them
a) Increases with mass number at high mass numbers
b) Decreases with mass number at high mass numbers
c) Increases with mass number at low mass numbers
d) Decreases with mass number at low mass numbers

716. The largest wavelength in the ultraviolet region of the hydrogen spectrum is 122 nm. The smallest wavelength in the infrared region of the hydrogen spectrum (to the nearest integer is)
a) 802 nm b) 823 nm c) 1882 nm d) 1648 nm

717. Electrons in a certain energy level $n = n_1$, can emit 3 spectral lines. When they are in another energy level, $n = n_2$. They can emit 6 spectral lines. The orbital speed of the electrons in the two orbits are in the ratio
a) 4 : 3 b) 3 : 4 c) 2 : 1 d) 1 : 2

718. Consider$\alpha -$ Particles, $\beta -$ Particles and $\gamma -$ rays, each having an energy of 0.5 MeV. In increasing order of penetrating powers, the radiations are
a) α, β, γ b) α, γ, β c) β, γ, α d) γ, β, α

719. In Bohr's model, if the atomic radius of the first orbit is r_0, then the radius of the fourth orbit is
a) r_0 b) $4r_0$ c) $r_0/16$ d) $16r_0$

720. Two radioactive materials X_1 and X_2 have decay constants 10λ and λ repectively. 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 $1/e$ after a time
a) $\frac{1}{10\lambda}$ b) $\frac{1}{11\lambda}$ c) $\frac{11}{10\lambda}$ d) $\frac{1}{9\lambda}$

721. If half-life of a substance is 3.8 days and its quantity is 10.38 g. Then substance quantity remaining left after 19 days will be
a) 0.151 g b) 0.32 g c) 1.51 g d) 0.16 g

722. The composition of an α-particle can be expressed be
a) $1P + 1N$ b) $1P + 2N$ c) $2P + 1N$ d) $2P + 2N$

723. The ionization potential of hydrogen atom is $-13.6\ eV$. An electron in the ground state of a hydrogen atom absorbs a photon of energy $12.75eV$. How many different spectral lines can one expect when the electron make a downward transition
a) 1 b) 4 c) 2 d) 6

724. The nucleus ${}_6C^{12}$ absorbs an energetic neutron and emits a beta particle (β) . The resulting nucleus is
a) ${}_7N^{14}$ b) ${}_7N^{13}$ c) ${}_5B^{13}$ d) ${}_6C^{13}$

725. The counting rate observed from a radioactive source at t =9s was 1600 counts^{-1} and at t =8 sit was 100 counts s^{-1}. The counting rate observed as counts per second at t =6s,will be
a) 400 b) 300 c) 250 d) 200

726. The size of an atom is of the order of
a) $10^{-8}m$ b) $10^{-10}m$ c) $10^{-12}m$ d) $10^{-14}m$

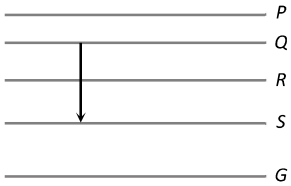
727. The half-life of At^{215} is 100μs. If a sample contains 215 mg of At^{215}, the activity of the sample initially is
a) 10^2Bq b) 3×10^{10} Bq c) 4.17×10^{24} Bq d) 1.16×10^5 Bq

728. If the energy of a hydrogen atom in nth orbit is E_n, then energy in the nth orbit of a singly ionized helium atom will be
a) $4E_n$ b) $E_n/4$ c) $2E_n$ d) $E_n/2$

729. For a substance the average life for α-emission is 1620 $years$ and for β emission is 405 $years$. After how much time the 1/4 of the material remains after α and β emission

a) 1500 $years$ b) 300 $years$ c) 449 $years$ d) 810 $years$

730. Figure shows the energy levels P, Q, R, S and G of an atom where G is the ground state. A red line in the emission spectrum of the atom can be obtained by an energy level change from Q to S. A blue line can be obtained by following energy level change



a) P to Q b) Q to R c) R to S d) R to G

731. γ-rays radiation can be used to create electron-positron pair. In this process of pair production, γ-rays energy cannot be less than

a) 5.0 MeV b) 4.02 MeV c) 15.0 MeV d) 1.02 MeV

732. According to Bohr's model, the radius of the second orbit of helium atom is

a) 0.53 Å b) 1.06 Å c) 2.12 Å d) 0.265 Å

733. The shortest wavelength in hydrogen spectrum of Lyman series when $R_H = 109678\ cm^{-1}$ is

a) 1002.7 Å b) 1215.67 Å c) 1127.30 Å d) 911.7 Å

734. Bohr's atom model assumes

a) The nucleus is of infinite mass and is at rest
b) Electrons in a quantized orbit will not radiate energy
c) Mass of electron remains constant
d) All the above conditions

735. Which state of triply ionized Beryllium (Be^{+++}) has the same orbital radius as that of the ground state of hydrogen

a) $n = 4$ b) $n = 3$ c) $n = 2$ d) $n = 1$

736. 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

737. When ${}_3Li^7$ nuclei are bombarded by protons, and the resultant nuclei are ${}_4Be^8$,the emitted particles will be

a) alpha particles b) beta particles c) gamma photons d) neutrons

738. Consider two nuclei of the same radioactive nuclide. One of the nuclei was created in a supernova explosion 5 billion years ago. The probability of decay during the next time is

a) Different for each nuclei
b) Nuclei created in explosion decays first
c) Nuclei created in the reactor decays first
d) Independent of the time of creation

739. 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%

740. Which of the following transition in Balmer series for hydrogen atom will have longest wavelength

a) $n = 2$ to $n = 1$ b) $n = 6$ to $n = 1$ c) $n = 3$ to $n = 2$ d) $n = 6$ to $n = 2$

741. m_p and $m_n$are masses of proton and neutron respectively. An element of mass M has Z protons and N neutrons then

a) $M > Zm_p + Nm_n$
b) $M = Zm_p + Nm_n$
c) $M < Zm_p + Nm_n$
d) M may be greater than less than or equal to $Zm_p + Nm_n$,depending on nature of element

742. A nuclear reaction given by

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

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

743. A sample of an element is 10.38 g. If half-life of element is 3.8 days, then after 19 days, how much quantity of element remains?
a) 0.151 g b) 0.32 g c) 1.51 g d) 0.16 g

744. The distance of closest approach of an α-particle fired towards a nucleus with momentum p, is r. If the momentum of the α-particle is $2p$, the corresponding distance of closest approach is
a) $r/2$ b) $2r$ c) $4r$ d) $r/4$

745. A free neutron decays into a proton, an electron and
a) A neutrino b) An antineutrino c) An alpha particle d) A beta particle

746. In nuclear reactions, we have the conservation of
a) Mass only b) Energy only
c) Momentum only d) Mass, energy and momentum

747. Electrons in the atom are held to the nucleus by
a) Coulomb's forces b) Nuclear forces c) Vander waal's forces d) Gravitational forces

748. The half-life of radium is about 1600 years. Of 100 g of radium existing now, 25 g will remain unchanged after
a) 2400 years b) 3200 years c) 4800 years d) 6400 years

749. U^{238} decays into Th^{234} by the emission of an α −particle. There follows a chain of further radioactive decays, either by α −decay or by β −decay. Eventually a stable nuclide is reached and after that, no further radioactive decay is possible. Which of the following stable nuclides is the end product of the U^{238} radioactive decay chain
a) Pb^{206} b) Pb^{207} c) Pb^{208} d) Pb^{209}

750. In a fission process, nucleus A divides into two nuclei B and C, their binding energies being E_a, E_b and E_c respectively. Then
a) $E_b + E_c = E_a$ b) $E_b + E_c > E_a$ c) $E_b + E_c < E_a$ d) $E_b . E_c = E_a$

751. 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

752. If the decay or disintegration constant of a radioactive substance is λ, then its half life and mean life are respectively
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 $\frac{1}{\lambda}$

753. In the following nuclear reaction
${}_6C^{11} \rightarrow {}_5B^{11} + \beta^+ + X$
What does X stand for?
a) A neutron b) A neutrino c) An electron d) A proton

754. The radioactivity of a given sample of whisky due to tritium (half life 12.3 years) was found to be only 3% of that measured in a recently purchased bottle marked "7 years old". The sample must have been prepared about
a) 220 years back b) 300 years back c) 400 years back d) 70 years back

755. If 200 MeV energy is released in the fission of a single nucleus of ${}_{92}U^{235}$. How many fissions must occur per second to produce a power of 1 kW?
a) 3.125×10^{13} b) 6.250×10^{13} c) 1.525×10^{13} d) None of these

756. Which of these is non-divisible
a) Nucleus b) Photon c) Proton d) Atom

757. The fission of ^{235}U can be triggered by the absorption of slow neutrons by a nucleus. Similarly a slow proton can also be used. This statement is
a) Correct b) Wrong
c) Information is insufficient d) None of these

758. Which one of the following statement is true, if half-life of a radioactive substance is 1 month?

a) 7/8th part of the substance will disintegrate in 3 months
b) 1/8th part of the substance will remain undecayed at the end of 4 months.
c) The substance will disintegrate completely in 4 months.
d) 1.16th part of the substance will remain undecayed at the end of 3 months

759. M_n and M_p represent mass of neutron and proton respectively. If an element having atomic mass M has N-neutrons and Z-protons, 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) $M = N[M_n + M_P]$

760. An electron jumps from the 4^{th} orbit to the 2^{nd} orbit of hydrogen atom. Given the Rydberg's constant $R = 10^5 cm^{-1}$. The frequency in Hz of the emitted radiation will be
a) $\frac{3}{16} \times 10^5$ b) $\frac{3}{16} \times 10^{15}$ c) $\frac{9}{16} \times 10^{15}$ d) $\frac{3}{4} \times 10^{15}$

761. The particles emitted by radioactive decay are deflected by magnetic field. The particles will be
a) Protons and α −particles
b) Electrons, protons and α −particles
c) Electrons, protons and neutrons
d) Electrons and α −particles

762. ${}_{92}U^{235}$undergoes successive disintegrations with the end product of ${}_{82}Pb^{203}$. The number of α andβ-particles emitted are
a) $\alpha = 6, \beta = 4$ b) $\alpha = 6, \beta = 0$ c) $\alpha = 8, \beta = 6$ d) $\alpha = 3, \beta = 3$

763. The magnetic moment (μ) of a revolving electron around the nucleus varies with principal quantum number n as
a) $\mu \propto n$ b) $\mu \propto 1/n$ c) $\mu \propto n^2$ d) $\mu \propto 1/n^2$

764. If the mass number of an atom is $A = 0$ and its electron configuration is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$, the number of neutrons and protons in its nucleus will be
a) 22, 18 b) 18, 22 c) 20, 20 d) 18, 18

765. The first excited state of hydrogen atom is 10.2 eV above its ground state. The temperature is needed to excite hydrogen atoms to first excited level, is
a) $7.9 \times 10^4\ K$ b) $3.5 \times 10^4\ K$ c) $5.8 \times 10^4\ K$ d) $14 \times 10^4\ K$

766. In hydrogen atom, if the difference in the energy of the electron in $n = 2$ and $n = 3$ orbits is E, the ionization energy of hydrogen atom is
a) 13.2 E b) 7.2 E c) 5.6 E d) 3.2 E

767. The wavelength of the energy emitted when electron comes from fourth orbit to second orbit in hydrogen is 20.397cm. The wavelength of energy for the same transition in He^+ is
a) 5.099 cm^{-1} b) 20.497 cm^{-1} c) 40.994 cm^{-1} d) 81.988 cm^{-1}

768. 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 $eV = 1.6 \times 10^{-19} J$)
a) 3.125×10^{13} b) 3.125×10^{14} c) 3.125×10^{15} d) 3.125×10^{16}

769. A radioactive substance has half-life of 60 min. During 3 h, the fraction of the substance that has to be decayed. will be
a) 87.5 % b) 52.5% c) 25.5% d) 8.5%

770. Half-life is measured by
a) Geiger-Muller counter
b) Carbon dating
c) Spectroscopic method
d) Wilson-Cloud chamber

771. The phenomenon of radioactivity is
a) Exothermic change which increases or decreases with temperature
b) Increases on applied pressure
c) Nuclear process does not depend on external factors
d) None of the above

772. An archaeologist analysis the wood in a prehistoric structure and finds that C^{14} (Half life = 5700 $years$) to C^{12} is only one-fourth of that found in the cells of buried plants. The age of the wood is about
a) 5700 $years$ b) 2850 $years$ c) 11,400 $years$ d) 22,800 $years$

773. Following process is known as $hv \rightarrow e^+ + e^-$
a) Pair production b) Photoelectric effect c) Compton effect d) Zeeman effect

774. 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
a) 1 : 16 b) 4 : 1 c) 1 : 4 d) 1 : 1

775. Which of the following cannot cause fission in a heavy nucleus
a) α-particle b) Proton c) Deutron d) Laser rays

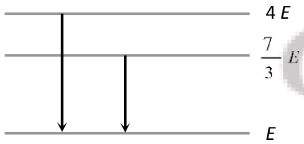
776. If in a nuclear fusion process, the masses of the fusing nuclei be m_1 and $m_2$and the mass of the resultant nucleus be m_3, then
a) $m_3 = m_1 + m_2$ b) $m_3 = |m_1 m_2|$ c) $m_3 < (m_1 + m_2)$ d) $m_3 > (m_1 + m_2)$

777. A moderator is used in nuclear reactors in order to
a) Slow down the speed of the neutrons b) Accelerate the neutrons
c) Increase the number of neutrons d) Decrease the number of neutrons

778. Rest mass energy of an electron is 0.54 MeV. If velocity of the electron is $0.8c$, then $K.E.$ of the electron is
a) 0.36 MeV b) 0.41 MeV c) 0.48 MeV d) 1.32 MeV

779. If the binding energies of a deuteron and an alpha particle are 1.125MeV and 7.2MeV, respectively , then the more stable of the two is
a) deuteron
b) Alpha-particle
c) Both (a) and (b)
d) Sometimes deuteron and Sometimes Alpha-particle

780. The following diagram indicates the energy levels of a certain atom when the system moves from $4E$ level to E. A photon of wavelength λ_1 is emitted. The wavelength of photon produced during it's transition from $\frac{7}{3}E$ level to E is λ_2. The ratio $\frac{\lambda_1}{\lambda_2}$ will be



a) $\frac{9}{4}$ b) $\frac{4}{9}$ c) $\frac{3}{2}$ d) $\frac{7}{3}$

781. 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

782. If the binding energy of the deutrium is 2.23 MeV. The mass defect given in $a.m.u.$ is
a) -0.0024 b) -0.0012 c) 0.0012 d) 0.0024

783. The transition of an electron from $n_2 = 5,6, \ldots \ldots$ to $n_1 = 4$ gives rise to
a) Pfund series b) Lyman series c) Paschen series d) Brackett series

784. The rad is the correct unit used to report the measurement of
a) The ability of a beam of gamma ray photons to produce ions in a target
b) The energy delivered by radiation to a target
c) The biological effect of radiation
d) The rate of decay of a radioactive source

785. Highly energetic electrons are bombarded on a target of an element containing 30 neutrons. The ratio of radii of nucleus to that of Helium nucleus is $14^{1/3}$. The atomic number of nucleus will be
a) 25 b) 26 c) 56 d) 30

786. A nucleus decays by β^+-emission followed by a$\gamma -$ emission. If the atomic and mass numbers of the parent nucleus are Z and A respectively, the corresponding numbers for the daughter nucleus are respectively
a) $Z - 1$ and $A - 1$ b) $Z + 1$ and A c) $Z - 1$ and A d) $Z + 1$ and $A - 1$

787. 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

788. In the following atoms and molecules for the transition from $n = 2$ to $n = 1$, the spectral line of minimum wavelength will be produced by
a) Hydrogen atom b) Deuterium atom c) Uni-ionized helium d) De-ionized lithium

789. Taking Rydberg's constant $R_H = 1.097 \times 10^7 m$, first and second wavelength of Balmer series in hydrogen spectrum is
a) 2000 Å, 3000Å b) 1575 Å, 2960 Å c) 6529 Å, 4280 Å d) 6552 Å, 4863 Å

790. In the Bohr model of the hydrogen atom, let R, v and E represent the radius of the orbit, the speed of electron and the total energy of the electron respectively. Which of the following quantity is proportional to the quantum number n
a) R/E b) E/v c) RE d) uR

791. The masses of two radioactive substances are same and their half-lives are 1 yr and 2 yr respectively. The ratio of their activities after 4 yr will be
a) 1:4 b) 1:2 c) 1:3 d) 1:6

792. 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) $A = 234, B = 90, C = 234, D = 93, E = \alpha$

793. $^{235}_{92}X \rightarrow {}^{231}_{91}Y$
Number of particles emitted in the reaction is
a) One electron and one neutron b) One neutron and one electron
c) One α and one neutron d) One α and one electron

794. For effective nuclear forces, the distance should be
a) $10^{-10}m$ b) $10^{-13}m$ c) $10^{-15}m$ d) $10^{-20}m$

795. Two radioactive sources A and B of half lives 1h and 2h respectively initially contain the same number of radioactive atoms. At the end of two hours, their rates of disintegration are in the ratio of
a) 1: 4 b) 1: 3 c) 1: 2 d) 1: 1

796. The energy equivalent of the atomic mass unit is
a) 1.6×10^{-19}J b) 6.02×10^{-23}J c) 931 J d) 931 MeV

797. If M_0 is the mass of an oxygen isotope $_8O^{17}$, $M_p and\ M_n$ are the masses of a proton and a neutron, respectively, the nuclear binding energy of the isotope is
a) $(M_o - 8M_p)c^2$ b) $(M_o - 8M_p - 9M_n)c^2$ c) M_oc^2 d) $(M_o - 17\ M_n)c^2$

798. The binding energies per nucleon of Li^7 and He^4 are 5.6 MeV and 7.06 MeV respectively, then the energy of the reaction
$Li^7 + p = 2[\ _2He^4]$ will be
a) 17.28 MeV b) 39.2 MeV c) 28.24 MeV d) 1.46 MeV

799. An energy of 24.6 eV is required to remove one of the electrons from a neutral helium atom. The energy (in eV) required to remove both the electrons from a neutral helium atom is
a) 79.0 b) 51.8 c) 49.2 d) 38.2

800. Which of the following rays are not electromagnetic waves
a) γ-rays b) β-rays c) Heat rays d) X-rays

801. If the mass of a radioactive sample is doubled, the activity of the sample and the disintegration constant of the sample are respectively
a) Increases, remains the same b) Decreases, increases
c) Decreases, remains same d) Increases, decreases

802. The ratio of the radii of the nuclei $_{13}Al^{27}$ and $_{54}Te^{125}$ is

a) $\sqrt{13}:\sqrt{52}$ b) $2\sqrt{13}:3\sqrt{52}$ c) $3\sqrt{3}:5\sqrt{5}$ d) $3:5$

803. 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

804. 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

805. The concept of stationary orbits was proposed by
a) Neil Bohr b) J.J. Thomson c) Rutherford d) I. Newton

806. A radioactive nucleus ${}_{92}X^{235}$ decays to ${}_{91}Y^{231}$. Which of the following particles are emitted
a) One alpha and one electron b) Two deuterons and one positron
c) One alpha and one proton d) One proton and four neutrons

807. If the series limit of Lymen series for Hydrogen atom is equal to the series limit of Balmer series for a hydrogen like atom, then atomic number of this hydrogen like atom will be
a) 1 b) 2 c) 3 d) 4

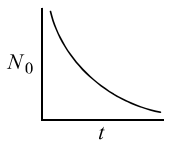
808. In helium nucleus, there are
a) 2 protons and 2 electrons b) 2 neutrons, 2 protons and 2 electrons
c) 2 protons and 2 neutrons d) 2 positrons and 2 protons

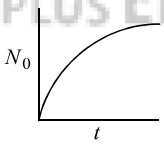
809. Light energy emitted by stars is due to
a) Breaking of nuclei b) Joining of nuclei
c) Burning of nuclei d) Reflection of solar light

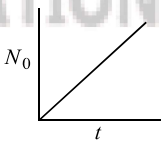
810. The nucleus which has radius one-third of the radius of Cs^{189} is
a) Be^9 b) Li^7 c) F^{19} d) C^{12}

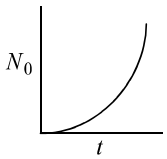
811. Equivalent energy of mass equal to 1 $a.m.u.$ is
a) 931 KeV b) 931 eV c) 931 MeV d) 9.31 MeV

812. A radioactive element A decay into stable element B, initially a fresh sample of A is available. In this sample variation in number of nuclei of B with time is shown by

a) 

b) 

c) 

d) 

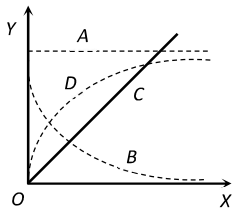
813. The average kinetic energy of the thermal neutrons is of the order of
a) 0.03 eV b) 3 eV c) 3 KeV d) 3 MeV

814. In a hydrogen atom, the distance between the electron and proton is $2.5 \times 10^{-11}m$. The electrical force of attraction between them will be
a) $2.8 \times 10^{-7}N$ b) $3.7 \times 10^{-7}N$ c) $6.2 \times 10^{-7}N$ d) $9.1 \times 10^{-7}N$

815. The energy equivalent to a kilogram of matter is about
a) 10^{20} J b) 10^{17} J c) 10^{14} J d) 10^{11} J

816. According to Bohr's theory the radius of electron in an orbit described by principle quantum number n and atomic number Z is proportional to
a) Z^2n^2 b) $\frac{Z^2}{n^2}$ c) $\frac{Z^2}{n}$ d) $\frac{n^2}{Z}$

817. In Fig. X represents time and Y represents activity of a radioactive sample. Then the activity of sample, varies with time according to the curve



a) A b) B c) C d) D

818. If m, m_n and m_p are the masses of ${}_ZX^A$ nucleus, neutron and proton respectively, then
a) $m < (A-Z)m_n + Zm_p$ b) $m = (A-Z)m_n + Zm_p$
c) $m = (A-Z)m_p + Zm_n$ d) $m > (A-Z)m_n + Zm_p$

819. The binding energy per nucleon of deuteron (${}_1^2$H)and helium nucleus (${}_2^4$He)is 1:1MeV and 7MeV respectively. If two deuteron nuclei react to form a single helium nucleus , then the energy released is
a) 13.9MeV b) 26.9MeV c) 23.6MeV d) 19.2MeV

820. Which of the following transitions in a hydrogen atom emits photon of the highest frequency
a) $n = 1$ to $n = 2$ b) $n = 2$ to $n = 1$ c) $n = 2$ to $n = 6$ d) $n = 6$ to $n = 2$

821. A photon creates a pair of electron positron with equal kinetic energy. Let kinetic energy of each particle is 0.29 MeV. Then what should be energy of the photon?
a) 1.60 MeV b) 1.63 MeV c) 2.0 MeV d) 1.90 MeV

822. A radioactive material has a half-life of 8 years. The activity of the material will decrease to about 1/8 of its original value in
a) 256 years b) 128 years c) 64 years d) 24 years

823. Which of the following cannot be emitted by radioactive substances during their decay?
a) Protons b) Neutrinos c) Helium nuclei d) Electrons

824. The nuclear reactor at Kaiga is a
a) Research reactor b) Fusion reactor c) Breeder reactor d) Power reactor

825. The mass of a ${}_3^7Li$ nucleus is $0.042u$ less than the sum of the masses of all its nucleons. The binding energy per nucleon of ${}_3^7Li$ nucleus is nearly
a) 23 MeV b) 46 MeV c) 5.6 MeV d) 3.9 MeV

826. Which one of the series of hydrogen spectrum is in the visible region
a) Lyman series b) Balmer series c) Paschen series d) Bracket series

827. The radius of nucleus is
a) Proportional to its mass number
b) Inversely Proportional to its mass number
c) Proportional to the cube root of its mass number
d) Not related to its mass number

828. Electron in hydrogen atom first jumps from third excited state to second excited state and then from second excited to the first excited state. The ratio of the wavelengths $\lambda_1 : \lambda_2$ emitted in the two cases is
a) 7/5 b) 27/20 c) 27/5 d) 20/7