PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

ATOMS, MOLECULES AND NUCLEI

Mcq Level I

1. If an electron in any hydrogen atom jumps from an orbit $n_i = 3$ to an orbit with level $n_f = 2,$ the frequency of the emitted radiation is :

A. $v = \frac{36c}{5R}$

B. $v = \frac{cR}{6}$

C. $v = \frac{5Rc}{36}$

D. $v = \frac{6c}{R}$

Answer: C

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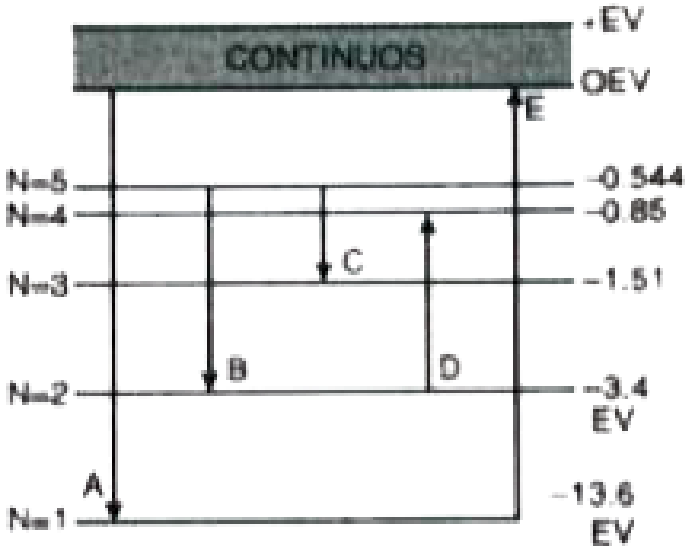
2. In the given diagram, the energy levels of hydrogen atom have been shown along with some transitions marked A, B, C, D and E. The transition A, B and C respectively represent :



A. The first member of the Lyman series, third member of Balmer series and the second member of Paschen series

B. Second member of Balmer series, and third member of Paschen series

C. The series limit of Lyman series, second member of Balmer series and second member of Paschen series

D. The series dimit of Lyman series, third member of Baltner series and second member of Paschen series

Answer: D

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3. The speed of electron in the first Bohr orbit is $\frac{C}{137}$, where C is speed of light in free space. The speed of electron in the 2nd Bohr orbit will be:

A. $\frac{1}{2}\left(\frac{C}{137}\right)$

B. $2 \times \left(\frac{C}{137}\right)$

C. $\frac{1}{4}\left(\frac{C}{137}\right)$

D. $A\left(\frac{C}{137}\right)$

Answer: A

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4. The ratio (in S.I. units) of magnetic dipole moment to that of the angular of electron of mass m kg and charge e coulomb in Bohr's orbit of hydrogen atom is :

A. $\frac{c}{2m}$

B. $\frac{e}{m}$

C. $\frac{2e}{m}$

D. None of these

Answer: A

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5. An α -particle of energy 5 MeV is scattered through 180° by a fixed uranium nuclous. The distance of closest approach is of the order:

A. $10^{-10}m$

B. $10^{-13}m$

C. $10^{-14}m$

D. $10^{-16}m$

Answer: C

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6. When Z is doubled in an atom, which of the following statements are consistent with Bohr's theory?

A. Energy of a state is doubled.

B. Radius of an orbit is doubled.

C. Velocity of electrons in an orbit is doubled.

D. Radius of an orbit is doubled.

Answer: C

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7. A light with an electric field $E = 165\left[\sin\left(22 \times 10^{15}t\right) + \sin\left(\pi < 10^{14}t\right)Vm^{-1}\right.$ where t is in seconds, falls on a metal of work function 2 eV. The maximum kinetic energy of the photoelectron is $\left(h = 4.14 \times 10^{15}eV.\ S\right)$

A. 1.8eV

B. 2.14eV

C. 2.34eV

D. 4.41eV

Answer: B

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8. Mosley's law for characteristic X-rays $\frac{1}{\lambda} = R(z-b)^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ is

Which of the following statements is/are correct?

A. It is applicable to all those atoms to which Bohr's theory is not applicable.

B. It is applicable to all energy levels of some atoms only

C. It cannot be applied for higher values of n_1 and n_2

D. It cannot be applied to higher values of Z.

Answer: C

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9. The flux of a α-particle at 2° is 1 x 10⁰, calculate the flux of $\alpha -$ particle at angle 60°.

A. 0.5

B. 0.75

C. 1.5

D. 1.2

Answer: C

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10. ${}_{92}U^{238}$ decays to a stable nucleus of ${}_{82}Pb^{206}$ In this process

A. 8α -particles and β --particles are emitted

B. 6 α-particles and 8 β- particles are emitted

C. 7 α- particles and 7 β-particles are emitted

D. 8 α-particles and 4 β-particles are emitted.

Answer: A

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11. An electron in a H_2 atom makes a transition from $n_1 \rightarrow n_2$. The time period of electron in the initial state is eight times that in the final state. Then ratio of $n_1 \quad \text{to} \quad n_2$:

A. $1:2$

B. $2:1$

C. $4:1$

D. $8:1$

Answer: B

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12. The velocity of an electron in the second orbit of ten times ionised sodium atom (Z=11) is v. The velocity of electron in its fifth orbit is:

A. v

B. $\frac{22}{5}v$

C. $\frac{5}{2}v$

D. $\frac{2}{5}v$

Answer: D

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13. Find radius of electron in first orbit when hydrogen atom in ground state is excited by mean of light of =975Å

A. $1.1 \times 10^{-11}m$

B. $2.5 \times 10^{-10}m$

C. $3.2 \times 10^{-9}m$

D. $6.6 \times 10^{-8}m$

Answer: A

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14. The radius of the smallest electron orbit in the hydrogen like atom is $\frac{0.51 \times 10^{-10}}{4}$ m, then it is :

A. Hydrogen atom

B. He^{+}

C. Li^{++}

D. Be^{+++}

Answer: D

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15. The difference in frequencies of series limit of Lymen series and Balmer series is equal to the frequency of the first line of the :

A. Lymen series

B. Balmer series

C. Paschen series

D. Brackett series.

Answer: A

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16. The wavelength of K_α line from an element of atomic number 51 is λ. From another element wavelength of K_α line is 4λ. What is the atomic number of the second element ?

A. 25

B. 26

C. 100

D. 99

Answer: B

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17. The area of the electron orbit for the ground state of hydrogen atom is A. Then what will be area of the electron orbit corresponding to the first excited state?

A. $4A$

B. 8A

C. 16A

D. 32A

Answer: C

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18. Wavelength of radiations emitted, when an electron jumps from a state A to C is 2000 Å and it is 6000 Å, when the clectron jumps from state B to state C. Wavelength of the radiations emitted, when an electron jumps from state A to B will be:

A. 2000 Å

B. 3000 Å

C. 4000 Å

D. 6000 Å

Answer: B

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19. Half-life of a substance is 20 minutes. What is the time between 33% decay and 67% decay ?

A. 20 minutes

B. 25 minutes

C. 30 minutes

D. 40 minutes.

Answer: A

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20. Electron in a hydrogen atom makes a transition from n_1 to n_2, where n_1 and n_2 are principal quantum numbers of two states. Assuming Bohr's model to be valid, time period of clectron in the n_1 state is found to be eight times the time period in the final state. Then possible values of principal quantum numbers n_1 and n_2 are:

A. 4,2

B. 6,3

C. 8,1

D. 8,3

Answer: A

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21. At a given time there are 25% undecayed nuclei in a sample. After 10 seconds number of undecayed nuclei reduces to 12-5%. Then mean life of

the nuclei will be about:

A. 10 sec

B. 15 sec

C. 20 sec

D. 22 sec

Answer: B

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22. Number of fission required in one second to attain a power level of 1 MW in an atom bomb will be:

A. 3.13×10^{16}

B. 2.27×10^{15}

C. 3.98×10^{16}

D. 1.651×10^{17}

Answer: A

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23. When a -particle of energy 3.5 MeV approaching gold nucleus, it undergoes scattering by 180°, then distance of closest approach is :

A. $12.7 \times 10^{-14} m$

B. 33.8 fermi

C. $41.4 \times 10^{-14} m$

D. 41.4 fermi

Answer: D

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24. If scattering angle θ and impact parameter b are related to each other by the relation $b = \frac{Ze^2 \cot \frac{\theta}{2}}{4\pi\varepsilon_0\left(\frac{1}{2}mv^2\right)}$ then angle of scattering for zero impact parameter will be

A. 0°

B. 90°

C. 180°

D. 45°

Answer: C

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25. A dust particle of mass 10^{-6} gm moves between two walls separated by 1.0 mm. If speed of the particle is $10^{-4} ms^{-1}$ then nth state of the particle will be :

A. 3×10^{10}

B. 3×10^{15}

C. 3×10^{17}

D. 3×10^{27}

Answer: C

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26. Angular momentum of an electron in an excited hydrogen atom having energy -3.4eV is :

A. $1.7 \times 10^{-34} Js$

B. $2.1 \times 10^{-34} Js$

C. $3.9 \times 10^{-34} Js$

D. $4.1 \times 10^{-35} Js$

Answer: B

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27. Binding energy per nucleon of $^{16}_{8}O$ is $(\text{given : mass of } {}^{16}_{8}O = 16.000000a.\,m.\,u.)$

A. 7.67MeV

B. 3.19MeV

C. 4.13MeV

D. 8.15MeV

Answer: A

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28. Fraction of the element decayed during its mean life will be:

A. e

B. $N_0 \log e$

C. $\frac{\log e}{N}$

D. $1 - \frac{1}{e}$

Answer: D

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29. Nuclear reactor in which luranium-235 is used as fuel, uses 2 kg of uranium-235 in 30 days. Then power output of the reactor will be (given : Energy released per fission =185 MeV):

A. 43.5 MW

B. 58.5 MW

C. 69.6 MW

D. 73.1 MW

Answer: B

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30. A neutron causes fission in $_{92}U^{235}$ producing $_{40}Zr^{97}, Te^{134}$ and some neutrons. What is at no. of Te and how many neutrons are released?

A. 82,7

B. 52,4

C. 26,2

D. 13,1

Answer: B

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31. Find the Q value of the reaction.

$_1H^2 + _3Li^6 \rightarrow _1H^1 + _3Li^7$

The rest mass of $_1H^2 = 2.01410a.\,m.\,u.$

$_3Li^6 = 6.01513a.\,m.\,u.$

$_3Li^7 = 7.01601a.\,m.\,u.$

$_1H^1 = 1.00783a.\,m.\,u.$

A. 5.1 MeV

B. 6.7 MeV

C. 8. MeV

D. 9.3 MeV

Answer: A

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32. In the fusion reaction ${}_1H^2 + {}_1H^2 tp_2He^3 + {}_0n^1$, douteron, helium and the neutron have masses 2.015 a.m.u., 3.017 a.mu, and 1-009 a.m.u. respectivoly. Find the total energy released if 1 kg of deuterium undergoes complete fusion :

A. 3×10^{12}

B. 6×10^{11}

C. 9×10^{13}

D. 10.2×10^{14}

Answer: C

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33. 90% of a radioactive sample is left undisintegrated after time I has elapsed, what percentage of initial sample will decay in a total time 2t:

A. 0.38

B. 0.19

C. 0.09

D. 0.62

Answer: B

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34. Calculate the specific activities of Na^{24} and U^{235} nuclides whose half lives are 15 hrs and $7.1 \times 10^8 yrs$:

A. $3.2 \times 10^{20}, 7.9 \times 10^{7} Bq/kg$

B. $4.5 \times 10^{22}, 4.5 \times 10^{9} Bq/kg$

C. $1.2 \times 10^{21}, 3.8 \times 10^{8} Bq/kg$

D. $6.2 \times 10^{23}, 1.9 \times 10^{10} Bq/kg$

Answer: A

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35. The B.E of ${}_{10}Ne^{20}$ is 160.6 MeV. Find its atomic mass. The rest mass of proton =1.007825 a.m.u. and that of neutron =1.008665 a.m.u :

A. 9.6243 a.m.u.

B. 11.2343 a.m.u.

C. 13.6976 a.m.u.

D. 19.9924 a.m.u.

Answer: A

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36. The activity of a radioactive substance reduces to $\frac{1}{32}$ of its initial value in $22.5 \times 10^9 yrs$. Find its disintegration constant :

A. $1.54 \times 10^{-10} / yr$

B. $4.5 \times 10^{-9} / yr$

C. $5.25 \times 10^{-8} / yr$

D. $7.25 \times 10^{-7} / yr$

Answer: A

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37. There is a sample containing 16g of radioactive material, the half-life of which is 2 days. What is the amount of sample left after 32 days:

A. less than 1 mg

B. 1g

C. 4g

D. 8g

Answer: A

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38. A freshly prepared radioactive source of half life 2 hours emits radiations of intensity, which is 64 time the permissible safe level. The minimum time after which it would be possible to work safely with this source is:

A. 6 hrs

B. 12 hrs

C. 24 hrs

D. 128hrs

Answer: B

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39. The binding energy per nucleon for deuteron $\left({}_{1}^{2}H\right)$ helium $\left({}_{2}^{4}He\right)$ are 1.1MeV and 7.0 MeV. The energy released when deuterons fuse to form a helium nucleus is:

A. 2.3 MeV

B. 23.6MeV

C. 28.0MeV

D. 30.2MeV

Answer: C

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40. The radioactivity of given sample of whisky due to tritium (half life = 12 yrs) was found to be only 3.125% of that measured in a recently purchased bottle marked "10 yrs old". By how many years ago sample must have been prepared ?

A. 20 yrs

B. 30 yrs

C. 50 yrs

D. 70 yrs

Answer: D

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41. A count rate meter is used to measure the activity of a given sample. At one instant meter shows 2400 counts/min. One hour later the count drops to 300 counts per minute. What is half life of the sample ?

A. 5 mintues

B. 10 mintues

C. 20 mintues

D. 25 mintues

Answer: C

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42. If 10% of a radioactive material decays in 5 days, then amount of original material left after 20 days is approximately :

A. 0.6

B. 0.65

C. 0.7

D. 0.75

Answer: B

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43. The atomic mass of $_7N^{15}$ is 15.000108 a.m.u. and that of $_8O^{16}$ is 15.994915 a.m.u. If mass of proton is 1-007825 a.m.u., then the minimum energy provided to remove the least tightly bound proton is :

A. 0.013018MeV

B. 12.13MeV

C. 13.018MeV

D. 12.13MeV

Answer: B

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44. The end product of the decay of $_{90}^{232}Thi s_{82}^{208}Pb$. The number of alpha and beta particle emitted are, respectively.

A. 3,4

B. 6,4

C. 6,0

D. 4,6

Answer: B

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45. A radioactive element X with a half life of 2 hours decays giving a satble element Y. After a time t, the ratio of X to Y atoms is 1 : 7, then time t is :

A. 6 hours

B. 4 hours

C. between 4 to 6 hours

D. 14 hours

Answer: A

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46. The counting rate observed from the radioactive source at t= 0 second was 1600 counts/sec and t= 8 sec, it was 100 count/sec. The counting rate per sec at t =6 sec will be:

A. 400

B. 300

C. 200

D. 150

Answer: C

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47. Find the half life of uranium, given that $3.23 \times 10^{-7} gm$ of radium is found per gm of uranium in old minerals. The atomic weight of uranium and radium are 238 and 226 and half life of radium is 1600 years :

A. $4.70 \times 10^{7} \text{years}$

B. $4.70 \times 10^{8} \text{years}$

C. $4.70 \times 10^{9} \text{years}$

D. $4.70 \times 10^{10} \text{years}$

Answer: C

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48. What is the mass of 1 curie of ${}_{27}C^{60}$? Half life of ${}_{27}C^{60}$ is 5.25 years:

A. $8.8 \times 10^{-6} kg$

B. $8.8 \times 10^{-7} kg$

C. $8.8 \times 10^{-8} kg$

D. $8.8 \times 10^{-9} kg$

Answer: B

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49. Over what distance in free space will the intensity of a 5eV neutron beam be reduced by a factor one half ?

A. 23808 km

B. 15070 km

C. 10208 km

D. 5028 km

Answer: A

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50. If 3×10^{-9} kg of radioactive ${}_{79}Au^{200}$ has an activity 58.9 Ci, then half life period of Au^{200} is:

A. $2.88 \times 10^{2}\,\text{sec}$

B. $2.88 \times 10^{3}\,\text{sec}$

C. $2.88\,\text{sec}$

D. $2.88 \times 10^{2}\,\text{sec}$

Answer: B

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51. The decay constant for the radioactive isotope ${}^{57}Co$ is $3 \times 10^{-8} s^{-1}$. The number of disintegrations taking place in a milligram of pure ${}^{57}Co$ per second is :

A. 10^{16}

B. 3×10^{11}

C. 3×10^6

D. 3×10^7

Answer: B

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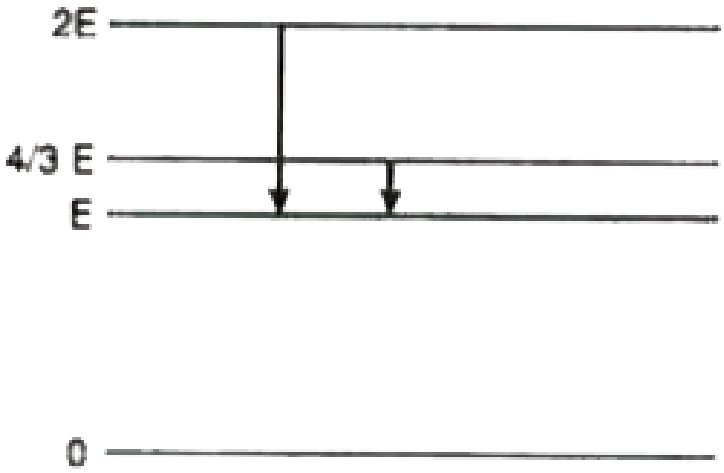
52. The given diagram indicates the energy levels of a certain atom. When the system moves from 2E level to E, a photon of wavelength 2 is emitted. The wavelength of photon produced during its transition from 4E/3 level



of E is:

A. $\lambda / 3$

B. $3\lambda/4$

C. $4\lambda/3$

D. 3λ

Answer: D

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53. Atomic mass number of an element is 232 and its atomic number is 90. The end product, of this radioactive element is an isotope of lead $\left({}^{208}_{82}Pb\right)$. The number of alpha and beta particles emitted is :

A. $\alpha = 3$ and $\beta = 3$

B. $\alpha = 6$ and $\beta = 4$

C. $\alpha = 6$ and $\beta = 0$

D. $\alpha = 1$ and $\beta = 6$

Answer: B

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

A. $1:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: A

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55. The ratio of the largest to shortest wavelength in Balmer series of hydrogen spectra is :

A. $\frac{25}{9}$

B. $\frac{17}{6}$

C. $\frac{9}{5}$

D. $\frac{5}{4}$

Answer: C

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56. If 10% of a radioactive material decays in 5 days, then the amount of original material left after 20 days is approximately

A. 0.6

B. 0.65

C. 0.7

D. 0.75

Answer: B

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57. An electron revolves round a nucleus of charge Ze. In order to excite the electron from the state n =2 to n =3, the energy required is 47.2 eV. Then Z is equal to :

A. 3

B. 4

C. 5

D. 2

Answer: C

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58. A radioactive nucleus is being produced at a constant rate α per second. Its decay constant is λ. If N_0 are the number of nuclei at time t =0, then maximum number of nuclei possible are :

A. $\frac{\alpha}{\lambda}$

B. $N_0 + \frac{\alpha}{\lambda}$

C. N_0

D. $\frac{\lambda}{\alpha} + N_0$

Answer: A

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59. The wavelength of K_α, X-rays for lead isotopes $Pb^{208}, Pb^{206}, Pb^{204}$ are $\lambda_1, \lambda_2,$ and λ_3 respectively. Then :

A. $\lambda_1 = \lambda_2 > \lambda_3$

B. $\lambda_1 > \lambda_2 > \lambda_3$

C. $\lambda_1 < \lambda_2 < \lambda_3$

D. $\lambda = \sqrt{\lambda_1 \lambda_3}$

Answer: D

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60. A hydrogen atom emits a photon of energy 12.1 eV. Its orbital angular momentum changes by $\triangle L$. Then $\triangle L$ equals :

A. $1.05 \times 10^{-34} Js$

B. $2.11 \times 10^{-34} Js$

C. $3.16 \times 10^{-34} Js$

D. $4.22 \times 10^{-34} Js$

Answer: B

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61. Statement I: In a hydrogen atom, if the difference in the energy of the electron between the second orbit and third orbit is E, then the ionisation potential of hydrogen atom will be 3.2 E.

Statement II: The minimum energy (in eV) electrons must have for all the

lines of all the series of H_2 spectrum to appear when the H_2 atoms are excited is 10.2 eV.

A. A Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. C Statement I is true, statement II is true, Statement II is correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: B

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62. Statement I: In fission the percentage of mass converted into energy is 0.1%.

Statement II : In fusion the percentage of mass converted into energy is 100%.

A. A Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. C Statement I is true, statement II is true, Statement II is correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: A

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63. Statement I: Nuclear forces' are charge independent.

Statement II: The nuclear forces act between nucleons only.

A. A Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. C Statement I is true, statement II is true, Statement II is correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: C

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64. Statement I: In fission reaction : ${}_{92}P^{263} \rightarrow Q^{141} + {}_{36}R^{10} + 3_0n'$.

The values of a = 56 and b = 119.

Statement II: The electrons emitted in β-decay have same energy.

A. A Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. C Statement I is true, statement II is true, Statement II is correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: A

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65. Statement I: Heavy water is preferred over ordinary water in moderator in nuclear reactor.

Statement II: Average number of neutrons per fission reaction is 2.5.

A. A Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. C Statement I is true, statement II is true, Statement II is correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: D

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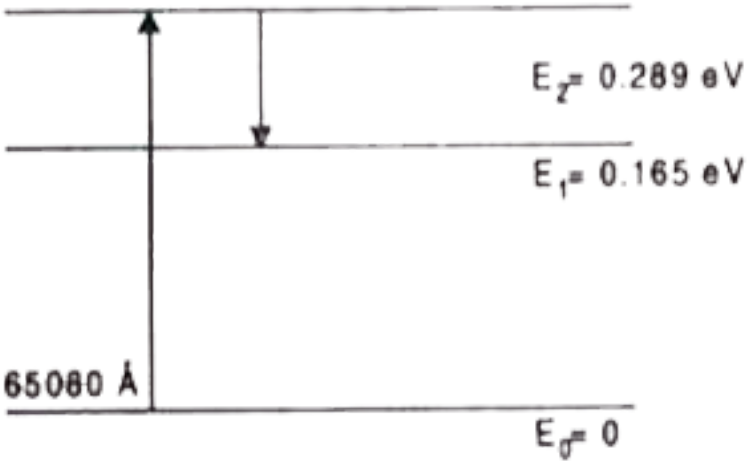
66. When sunlight shines on the atmosphere, mass of CO_2 at an altitude of 75 km undergo natural laser action. The energy levels involved in the action are shown in fig Population inversion occurs between levels



E_2 and E_1.

66. The wavelength of sunlight exciting the molecules in laser action is

A. 25010 Å

B. 43015Å

C. 52070Å

D. 65080Å

Answer: B

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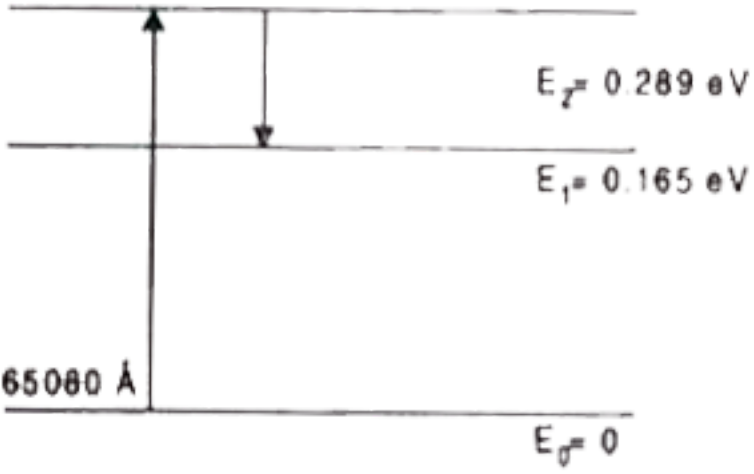
67. When sunlight shines on the atmosphere, mass of CO_2 at an altitude of 75 km undergo natural laser action. The energy levels involved in the action are shown in fig Population inversion occurs between levels



E_2 and E_1.

The wavelength at which lasing occurs is

A. 60100Å

B. 62520Å

C. 90450Å

D. 100250Å

Answer: D

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68. The energy of an electron in an excited hydrogen atom is -3.4 eV

The corresponding excited state (n) is

A. 2

B. 3

C. 4

D. 5

Answer: A

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69. The energy of an electron in an excited hydrogen atom is -3.4 eV

The angular momentum of electron is

A. $1.1 \times 10^{-34} Js$

B. $1.52 \times 10^{-34} Js$

C. $2.11 \times 10^{-34} Js$

D. $2.5 \times 10^{-34} Js$

Answer: C

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70. A radioisotope with At. wt. 99 has a half-life of 6 hours. A solution with $10^{-12} gm$ of this isotope is provided to perum, Then

Activity of solution in beginning is

A. $7.02 \times 10^{8} / hr$

B. $6.5 \times 10^{8} / hr$

C. $3.21 \times 10^8 / hr$

D. $14.05 \times 10^8 / hr$

Answer: D

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71. A radioisotope with At. wt. 99 has a half-life of 6 hours. A solution with $10^{-12} gm$ of this isotope is provided to perum, Then

Activity at the end of one hour is

A. $3.13 \times 10^8 / hr$

B. $6.26 \times 10^8 / hr$

C. $9.39 \times 10^8 / hr$

D. $10.2 \times 10^7 / hr$

Answer: B

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72. A doubly ionised lithium atom is H_2 -like with atomic no. 3. It is excited to produce radiations,

Wavelength of radiations required to excite the electron in Li^{++} from the Ist to Illrd Bohr orbit is

A. 101.21Å

B. 202.42Å

C. 303.63Å

D. 113.71Å

Answer: D

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73. A doubly ionised lithium atom is H_2 -like with atomic no. 3. It is excited to produce radiations,

The spectral lines observed in emission spectrum of the above excited are

A. 4

B. 3

C. 2

D. 1

Answer: B

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74. A nuclear reactor generates power at 50% efficiency, by fusion ${}_{92}U^{235}$ into two canal fragments of ${}_{6}Pd^{116}$ with the emission of two gamma rays and three neutrons. The average B.E. per particle of U^{235} and Pd^{116} is 7.2 MeV and 8.2 MeV respectively.

The energy released in one fission event is

A. 180MeV

B. 190MeV

C. 200MeV

D. 210MeV

Answer: C

View Text Solution

75. A nuclear reactor generates power at 50% efficiency, by fusion ${}_{92}U^{235}$ into two canal fragments of ${}_{6}Pd^{116}$ with the emission of two gamma rays and three neutrons. The average B.E. per particle of U^{235} and Pd^{116} is 7.2 MeV and 8.2 MeV respectively.

75. Amount of U235 consumed per hour to produce 1600 mega watt power is

A. 0.02kg

B. 0.05kg

C. 0.14kg

D. 10.1kg

Answer: C

View Text Solution

76. 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 :

A. 3.61×10^{10}

B. 3.61×10^{12}

C. 3.11×10^{15}

D. 3.11×10^{16}

Answer: A

View Text Solution

77. The temperature at which average kinetic energy of an atom in gaseous hydrogen becomes equal to the binding energy of the electron in hydrogen atom, is of the order of

A. $10^4 K$

B. $10^5 K$

C. $10^3 K$

D. $10^2 K$

Answer: B

View Text Solution

78. Which of the following represent γ -decay ?

A. ${}^A X_Z + \gamma = {}^A X_{Z-1} + a + b$

B. ${}^A X_Z + {}^1 n_0 = {}^{A-3} X_{Z-2} + c$

C. ${}^A X_Z \rightarrow {}^A X_Z + f$

D. ${}^A X_Z + e_{-1} \rightarrow {}^A X_Z + g$

Answer: C

View Text Solution

79. A high powered laser beam $(\lambda = 630nm)$ with a beam diameter of 0.1 m is aimed at the Moon, $3.8 \times 10^8 m$ distant. The beam spreads only because of diffraction, The angular location of the edge of the central diffraction disc is given by $\sin\theta = \frac{1.22\lambda}{d}$ where d is the diameter of the beam aperture. What is the diameter of the central diffraction disc on the Moon's surface ?

A. 1010.2m

B. 2080.5m

C. 3013.4m

D. 4040.9m

Answer: C

View Text Solution

80. A hydrogen atom and Li^{++} ion are both in the second excited state. If l_H and l_{Li} are the respective electronic moments, and En and EL their respective energies then

A. $l_H > l_{Li}$ and $|E_H| > |E_L|$

B. $l_H = l_{Li}$ and $|E_H| < |E_{Li}|$

C. $l_H = l_{Li}$ and $|E_H| > |E_{Li}|$

D. $l_H < L_{Li}$ and $|E_H| < |E_{Li}|$

Answer: B

View Text Solution

81. A nucleus with Z =92 emits the following in a sequence $\alpha, \beta, \alpha, \alpha, \alpha, \alpha, \alpha, \beta^-, \beta^-, \alpha, \beta^+, \beta^+, \alpha$. The Z of the resulting nucleus is :

A. 78

B. 82

C. 74

D. 76

Answer: A

View Text Solution

82. If the atom ${}_{100}Fm^{257}$ follow the Bohr's model and the radius of ${}_{100}Fm^{257}$ is n tince the Bohr radius, then find n :

A. 100

B. 200

C. 4

D. $\frac{1}{4}$

Answer: D

View Text Solution

83. A 280 days old radioactive substance showe an activity of 6000 dps. 140 days later its acitivity becomes 3000 dps. What was its initial acitivity?

A. 2000 dps

B. 24000 dps

C. 12000 dps

D. 6000 dps

Answer: B

View Text Solution

84. For sample of $^{66}Cu,$ 7/8 of it decays in 15 min. The half-life of sample is:

A. 5 min

B. $\frac{7}{1}\min$

C. 10 min

D. 14 min

Answer: A

View Text Solution

85. If radius of ${}^{27}_{13}Al$ is 3.6 Fermi, then radius of ${}^{125}_{52}Te$ is nearly

A. 4 Fermi

B. 5 Fermi

C. 6 Fermi

D. 8 Fermi

Answer: C

View Text Solution

86. A nuclear transformation is denoted by $X(n, \alpha), {}^{7}_{3}Li.$ Which of the following is X nucleus ?

A. ${}^{9}_{5}B$

B. ${}^{11}_{4}Be$

C. ${}^{12}_{6}C$

D. ${}^{10}_{5}B$

Answer: D

View Text Solution

87. The wavelength of k_α line of X-ray spectrum of an ekonsent of atomic number z = 11 in λ. The wavelength of same time of element of atomic number is z' is 4λ. z' is

A. 4

B. 6

C. 44

D. 11

Answer: B

View Text Solution

88. If B.B/ nucleon in ${}_3^7Li$ and ${}_2He^4$ nuclic are 5.6 Mev and 7.06 MeV, then in the reaction $p + {}_3^7Li \rightarrow 2{}_2^4He$, energy of proton must be :

A. 39.2MeV

B. 28.24MeV

C. 17.28MeV

D. 1.46MeV

Answer: C

View Text Solution

89. Through what minimum potential must an electron in an X-ray tube be accelerated so that it can produce X- rays with wavelength of 0.050 nm ?

A. 12.62KV

B. 24.847KV

C. 32.52KV

D. 40.8KV

Answer: B

View Text Solution

90. When $^{7}_{3}Li$ is bombarded by protons, the resultant nuclie is $^{8}_{4}Be,$ then emitted particle is :

A. neutrons

B. α-particle

C. β-particle

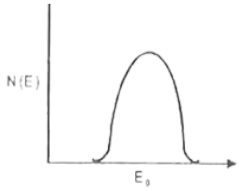
D. γ-rays

Answer: D

View Text Solution

91. The energy spectrum of β-particle {no. N (E)] as a function of β -energy $[E_0]$ from radioactive source is :

A.



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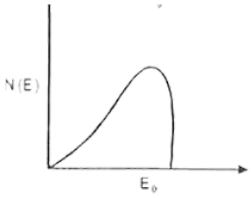

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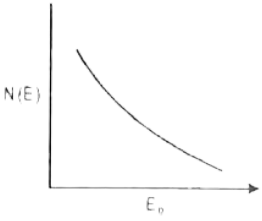
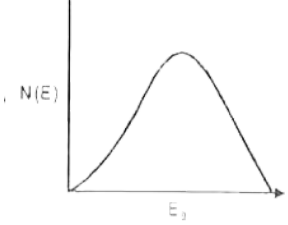




D.

Answer: B

View Text Solution

92. Which of the following transitiona in hydrogen atoms emit photons of highest frequency?

A. n=6 to n=2

B. n=2 to n=1

C. n=1 to n=2

D. n=2 to n=6

Answer: B

View Text Solution

93. The half-life period of a radioactive element X is same as mean life of another radioactive element Y. Initially they have same no. of atoms, then:

A. Y decays faster than X

B. X and Y decay equally initially

C. X and Y decay at same rate always

D. X will decay faster than Y.

Answer: A

View Text Solution

94. When a beam of accelerated electrons collides with a target then continuous spectrum of X-rays is emitted. Which wavelength will be absent in the spectrum of X-ray emitted from X-ray tube operated at 40 kV ?

A. 1.5Å

B. 0.5Å

C. 0.25Å

D. 1Å

Answer: C

View Text Solution

95. Some laws processes are given in column I. Match these with the physical phenomena given in column II.

A.

Column I	Column II
(a) Transition between two atomic energy	(p) Characteristic

B.

Column I	Column II
(b) Electron emission from a material	(q) Photoelectric effect

C.

Column I	Column II
(c) Mosley's law	(r) Hydrogen spectrum

D.

$$\left\{\begin{array}{ll} & \text{Column I} \\ (d) & \text{Change of photon energy into kinetic energy of electrons} \end{array}\right.$$

Answer: A::B::C::D

View Text Solution

96. Statement I: Energy is released when heavy nuclei undergo fission or light nuclei undergo fusion.

Statement II : For heavy nuclei, binding energy per nucleon increases with increasing Z while for light nuclei it decreases with increasing Z.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. Statement I is true, statement II is true. Statement II is correct explanation for statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation for statement

Answer: A

View Text Solution

97. He^+ ions are excited to respective first excited states. Subsequently, H-atoms transfer their total excitation Energy to Het jons collisions). Assume that the Bohr model of atom is exactly valid.

The quantum number n of the state finally populated in He+ ions is

A. 2

B. 3

C. 4

D. 5

Answer: C

View Text Solution

98. He^+ ions are excited to respective first excited states. Subsequently, H-atoms transfer their total excitation Energy to Het jons collisions). Assume that the Bohr model of atom is exactly valid.

The wavelength of light emitted in the visible region by He^+ ions after collisions with H atoms is

A. $6.5 \times 10^{-7} m$

B. $5.6 \times 10^{-7} m$

C. $4.8 \times 10^{-7} m$

D. $4.0 \times 10^{-7} m$

Answer: C

View Text Solution

99. He^+ ions are excited to respective first excited states. Subsequently, H-atoms transfer their total excitation Energy to Het jons collisions). Assume that the Bohr model of atom is exactly valid.

The ratio of the kinetic energy of the n= 2 electron for the H atom to that of He^+ ion is

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 1

D. 2

Answer: A

View Text Solution

100. When a particle is restricted to move along x-axis between x = 0 and x = 4, where a is of nanometer dimension, its energy can take only certain specific values. The allowed energies of the particle moving in such a restricted region, correspond to the formation of standing waves with nodes at its ends r = 0 and x= a. The wavelength of this standing wave is related to the linear momentum p of the particle according to the de-Broglie relation. The energy of the particle of mass m is related to its

linear momentum as $E = p^2/2m$. Thus, the energy of the particle can be denoted by a quantum number 'r' taking values 1, 2, 3, ... (n = 1, called the ground state) corresponding to the number of loops in the standing wave. Use the model described above to answer the following three questions for a particle moving in the line x=0 to x=a. Take $h = 6.6 \times 10^{-34} Js$ and $e = 1.6 \times 10^{-19} C$.

The allowed energy for the particle for a particular value of n is proportional to

A. a^{-2}

B. $a^{-3/2}$

C. a^{-1}

D. a^2

Answer: A

View Text Solution

101. When a particle is restricted to move along x-axis between x = 0 and x = 4, where a is of nanometer dimension, its energy can take only certain specific values. The allowed energies of the particle moving in such a restricted region, correspond to the formation of standing waves with nodes at its ends r = 0 and x= a. The wavelength of this standing wave is related to the linear momentum p of the particle according to the de-Broglie relation. The energy of the particle of mass m is related to its linear momentum as $E = p^2/2m$. Thus, the energy of the particle can be denoted by a quantum number 'r' taking values 1, 2, 3, ... (n = 1, called the ground state) corresponding to the number of loops in the standing wave. Use the model described above to answer the following three questions for a particle moving in the line x=0 to x=a. Take $h = 6.6 \times 10^{-34} Js$ and $e = 1.6 \times 10^{-19} C$.

If the mass of the particle is $m = 1.0 \times 10^{-30}$ kg and a= 6.6 nm, the energy of the particle in its ground state is close to

A. 0.8meV

B. 8meV

C. 80meV

D. 800meV

Answer: B

View Text Solution

102. When a particle is restricted to move along x-axis between x = 0 and x = 4, where a is of nanometer dimension, its energy can take only certain specific values. The allowed energies of the particle moving in such a restricted region, correspond to the formation of standing waves with nodes at its ends r = 0 and x= a. The wavelength of this standing wave is related to the linear momentum p of the particle according to the de-Broglie relation. The energy of the particle of mass m is related to its linear momentum as $E = p^2/2m$. Thus, the energy of the particle can be denoted by a quantum number 'r' taking values 1, 2, 3, ... (n = 1, called the ground state) corresponding to the number of loops in the standing wave. Use the model described above to answer the following three questions for a particle moving in the line x=0 to x=a. Take

$h = 6.6 \times 10^{-34} Js$ and $e = 1.6 \times 10^{-19} C$.

The speed of the particle that can take discrete values is proportional to

A. $n^{-3/2}$

B. n^{-1}

C. $a^{1/2}$

D. n

Answer: D

View Text Solution

103. In the core of nuclear fusion reactor, the gas becomes plasma because of

A. strong nuclear force acting between the deuterons

B. Coulomb force acting between the deuterons

C. Coulomb force acting between deuteron electron pairs

D. the high temperature maintained inside the reactor core.

Answer: D

View Text Solution

Mcq Level Ii

1. The ionisation potential of mercury is 10.39 volt. To gain energy sufficient enough to ionise mercury, an electron must travel in an electric field of $1.5 \times 10^6 Vm^{-1}$ at distance of :

A. $\frac{10.39}{1.5 \times 10^6} m$

B. $10.39 \times 1.5 \times 10^6 m$

C. $10.39 \times 1.6 \times 10^{-19} m$

D. $\frac{10.39 \times 1.6 \times 10^{-19}}{1.5 \times 10^6} m$

Answer: A

View Text Solution

View Text Solution

2. The ratio of longest wavelength and the shortest wavelength as observed in the five spectral series of emission spectrum of hydrogen is:

A. $\frac{4}{3}$

B. $\frac{525}{376}$

C. 25

D. $\frac{900}{11}$

Answer: D

View Text Solution

3. The Rydberg constant of H_2 atom is 10967700 m^{-1}. Calculate the short and long wavelength limits in its Lyman series :

A. 602 Å, 906Å

B. 204Å, 306Å

C. 911Å, 1212Å

D. None of these

Answer: C

View Text Solution

4. Find the recoil speed of a hydrogen atom after it emits a photon in going from n= 5 state to n= 1 state $\left(R = 1.097 \times 10^7 m^{-1}\right)$:

A. $2.4ms^{-1}$

B. $4.18ms^{-1}$

C. $3.2ms^{-1}$

D. $6.4ms^{-1}$

Answer: B

View Text Solution

5. The hydrogen atom in the ground state excited by means of light of $\lambda = 975\text{Å}$. How many different hires are possible in resultant spectrum?

A. 4

B. 3

C. 2

D. 6

Answer: D

View Text Solution

6. In above question, calculate the longest wavelength produced :

A. 18800 Å

B. 9800Å

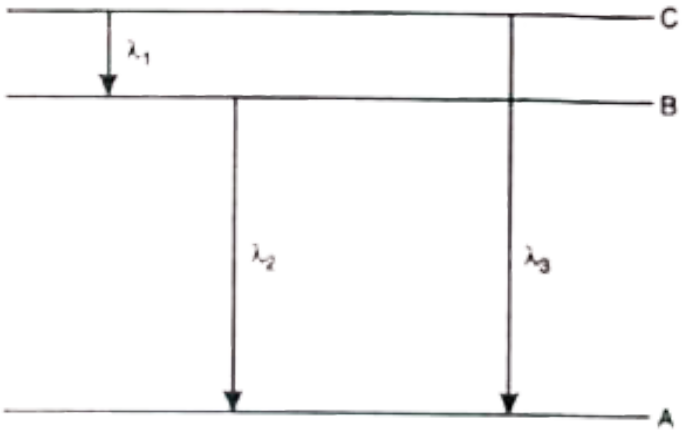
C. 12400Å

D. 8800Å

Answer: A

View Text Solution

7. Energy levels A, B, C of a certain atom corresponding to increasing values of energy are $E_A < E_B < E_C \lambda_1, \lambda_2, \lambda_3$ are the corresponding wavelengths of the radiations corresponding to the transitions C to B, B to A and C to A respectively. Which of the following statements is true ?



A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_2 = \dfrac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

C. $\lambda_1 + \lambda_2 + \lambda_3 = 0$

D. $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

Answer: B

View Text Solution

8. If the speed of the electron in a hydrogen atom orbit of principal quantum number n be V, then the curve showing variation of V with n is:

A. a straight line

B. a parabola

C. a rectangular hyperbola

D. on helix.

Answer: C

View Text Solution

9. A hydrogen atom in the ground state absorbe 12.09 eV of energy. The change in the orbital angular momentum of the electron is:

A. $+1.05 \times 10^{-34} Js$

B. $+2.11 \times 10^{-34} Js$

C. $-2.11 \times 10^{-34} Js$

D. $4.22 \times 10^{-34} Js$

Answer: B

View Text Solution

10. If elements with principal quantum number n greater than four were not allowed in nature, then number of elements would be:

A. 60

B. 32

C. 4

D. 64

Answer: A

View Text Solution

11. If 10% of a substance decays in 10 days, then approximate percentage of substance left after 24 days

A. 78

B. 70

C. 75

D. 80

Answer: A

View Text Solution

12. Mean lives of a radioactive substance are 1620 and 405 years for α and β -emission respectively. If α and β decays are simultaneous, then time during which three fourth of the sample will decay is :

A. 410 years

B. 442 years

C. 449 years

D. 512 years

Answer: C

View Text Solution

13. A U^{238} preparation of mass 1 g emits $1.24 \times 10^4 \alpha$ -particles per second. Find the half life of this nuclide and the activity of the preparation in becquerels:

A. $4.5 \times 10^9 yrs, 1.24 \times 10^4 Bq$

B. $1.5 \times 10^{10} yrs, 1.01 \times 10^{5} Bq$

C. $6.2 \times 10^{10} yrs, 3.24 \times 10^{5} Bq$

D. $2.6 \times 10^{8} yrs, 1.4 \times 10^{4} Bq$

Answer: A

View Text Solution

14. Determine the age of an ancient wooden piece, if it is known that specific activity of C^{14} nuclide in it amounts to $\frac{3}{5}$ of that in freshly fallen trees. The half life of C^{14} nuclide is 5570 yrs

A. $2.2 \times 10^{2} yrs$

B. $90 \times 10^{1} yrs$

C. $2.9 \times 10^{4} yrs$

D. $4.1 \times 10^{3} yrs$

Answer: D

View Text Solution

15. The isotopes of U^{238} and U^{235} occur in nature in the ratio 128 : 1. Assuming that at time of earth's formation, they were equal in ratio, make an estimate of age of earth. The half lives of U^{238} and U^{235} are $4.5 \times 10^9 yrs$ and 7.13×10^8 yrs respectively:

A. $2.2 \times 10^7 yrs$

B. $3.4 \times 10^8 yrs$

C. $5.9 \times 10^9 yrs$

D. $6.5 \times 10^{10} yrs$

Answer: C

View Text Solution

16. Under suitable conditions two a-particles can combine to produce a proton and a nuclide of Li^7. What minimum K.E. must the α -particle

have in order that the reaction, may proceed. The range of nuclear interaction is $10^{-14}m$:

A. 2.2MeV

B. 0.576MeV

C. 1.6MeV

D. 3.2MeV

Answer: B

View Text Solution

17. The radioactivity of a sample is R_1 at a time t_1 and R_2 at time t_2. If half life of sample is T, then no. of atoms that have disintegrated in time $(t_2 - t_1)$ is proportional

A. $R_1t_1 - R_2t_2$

B. $(R_1 - R_2)^{-1}$

C. $\frac{R_1 - R_2}{T}$

D. $(R_1 - R_2)T$

Answer: D

View Text Solution

18. Assuming that about 20 MeV of energy in released per fusion in the reaction

$_1H^2 + _1H^3 \rightarrow _0n^1 + _2He^4$.

then the mass of $_1H^4$ consumes per day in a bowiem reactor of puwwer Imawat will styroximately be:

A. 0.001gm

B. 0.1gm

C. 10.0gm

D. 1000gm

Answer: B

View Text Solution

19. The intensity of $\gamma -$ rays falls to $\frac{1}{8}th$ of its value after passing through 27 mm of lead toil. What should be thickness of the foil to reduce intensity of γ- rays of its original value?

A. 24 mm

B. 18mm

C. 12mm

D. 9mm

Answer: D

View Text Solution

20. The half life of a cobalt radio istope is 5.3 years. What strength will a milli curic source of isotope have after a period of one year?

A. 0.10 mci

B. 1.21 mci

C. 0.87 mci

D. 0.78 mci

Answer: C

View Text Solution

21. Some amount of radioactive substance (half life =10 days) is spread inside a room and consequently the level of radiation becomes 50 times the permissible level for normal occupancy of the room. After how many days the room will be safe for occupation ?

A. 45.56 days

B. 12.22 days

C. 56.45 days

D. 15.45 days

Answer: C

View Text Solution

22. If λ is decay constant of a nucleus, find the probability that a nucleus will decay in time t and further will not decay in time t:

A. $\left(1-e^{\lambda t}\right)^{-1}, e^{-\lambda t}$

B. $\left(1-e^{-\lambda t}\right), e^{-\lambda t}$

C. $e^{-\lambda t}, \left(1-e^{-\lambda t}\right)$

D. $\left(e^{-\lambda t}\right)^{-1}, \left(1-e^{-\lambda t}\right)$

Answer: B

View Text Solution

23. Two radioactive nuclei A and B have their disintegration constant λ_A and λ_B respectively. Initially N_A and N_B number of nuclei are taken,

then the time after which their undisintegrated nuclei are same is :

A. $\frac{\lambda_A \lambda_B}{(\lambda_A - \lambda_B)} \frac{\ln(N_B)}{N_A}$

B. $\frac{1}{(\lambda_A + \lambda_B)} \frac{\ln(N_B)}{N_A}$

C. $\frac{1}{(\lambda_B - \lambda_A)} \frac{\ln(N_B)}{N_A}$

D. $\frac{1}{(\lambda_A - \lambda)} \frac{N_B}{N_A}$

Answer: C

View Text Solution

24. The K_α and K_β lines of characteristic X-ray spectrum of molybdenum are 0.76 Å and 0.64 Å respectively, The wavelength of La line is :

A. 1.4Å

B. 2.4Å

C. 4.1Å

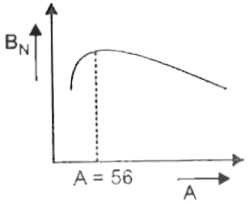
D. 3.6Å

Answer: C

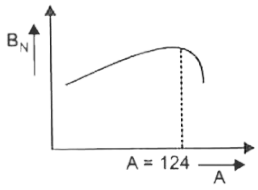
View Text Solution

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

A.



B.



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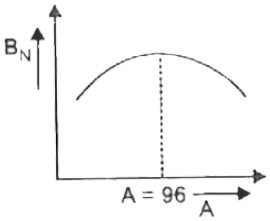
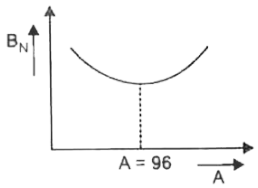


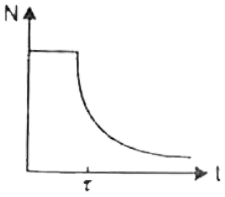


D.

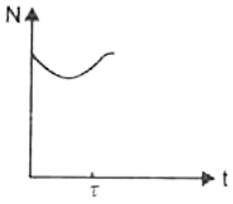
Answer: A

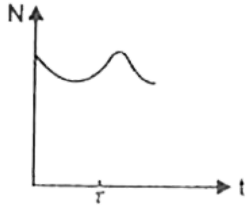
View Text Solution

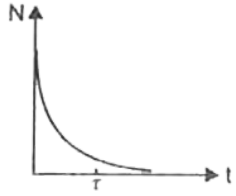
26. A radioactive sample consists of two distinct species having equal number of atoms initially. The mean life time of one species is τ and that of the other is 5τ. The decay products in both cases are stable. A plot is made of the total number of radioactive nuclei as a function of time. Which of the following figures best represents the form of this plot.



A.

B. 

C. 

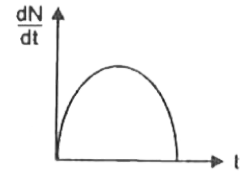
D. 

Answer: D

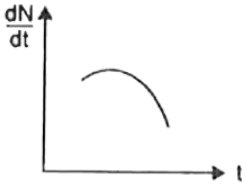
View Text Solution

27. 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

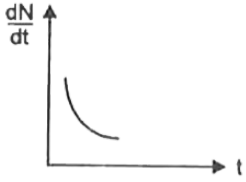
A.



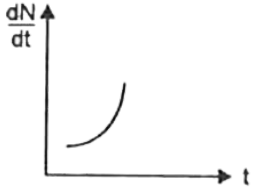
B.



C.



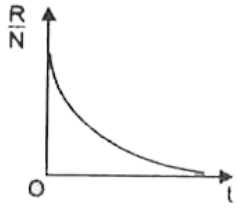
D.

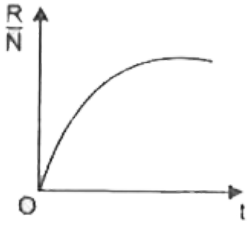


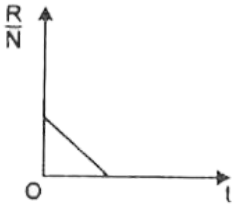
Answer: C

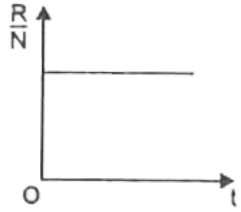
View Text Solution

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

A. 

B. 

C. 

D. 

Answer: D

View Text Solution

29. The possible quantum numbers for 3d electrons are

A. $n = 3, l = 1, m_1 = +1, m_s = -\frac{1}{2}$

B. $n = 3, l = 2, m_1 = +2, m_s = -\frac{1}{2}$

C. $n = 3, l = 1, m_1 = +1, m_s = +\frac{1}{2}$

D. $n = 3, l = 0, m_1 = +1, m_s = -\frac{1}{2}$

Answer: B

View Text Solution

30. 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

Answer: A

View Text Solution

31. The shortest wavelength in the Lyman series of hydrogen spectrum is 912 Å corresponding to a photon energy of 13.6 eV. The shortest wavelength in the Balmer series is about

A. 3648Å

B. 8208Å

C. 1228Å

D. 6566Å

Answer: A

View Text Solution

32. 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. $2:1$

Answer: A

View Text Solution

33. Energy of an etectron in och orbit of hydrogen atom is $k = \frac{1}{4\pi\varepsilon_0}$

A. $-\frac{2\pi^2 k^2 me^4}{n^2 h^2}$

B. $-\frac{4\pi^2 mk^2}{n^2 h^2}$

C. $-\frac{n^2 h^2}{2\pi kme^4}$

D. $-\frac{n^2 h^2}{4\pi^2 kme^2}$

Answer: A

View Text Solution

34. The energy of electron in the nth orbit of hydrogen atom is expressed as $E_m = \frac{-13.6}{n^2} eV$. The shortest and longest wavelength of Lyman series will be

A. 910Å, 1213Å

B. 5463Å, 7858Å

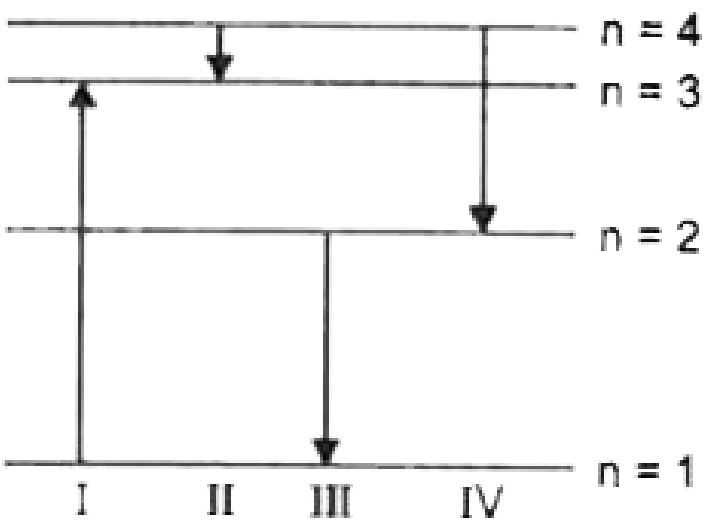
C. 1315Å, 1530Å

D. None of these

Answer: A

View Text Solution

35. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the



A. I

B. II

C. III

D. IV

Answer: C

View Text Solution

36. As the electrons 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 two-fold, U two-fold

C. K four-fold, U four-fold

D. K two-fold, U also two-fold

Answer: C

View Text Solution

37. In hydrogen atom, the electron is moving round the nucleus with velocity $2.18 \times 10^6 m/s$ is an orbit of radius of 0.528 Å. The acceleartion 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. $9 \times 10^{-22} m/s^2$

Answer: B

View Text Solution

38. The ionization onergy of Li^{++} is equal to

A. 9hcR

B. 6hcR

C. 2hcR

D. hcR

Answer: A

View Text Solution

39. 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. $1:2$

Answer: A

View Text Solution

40. 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

Answer: B

View Text Solution

41. 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

Answer: C

View Text Solution

42. 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. $\frac{1}{v_1} = \frac{1}{v_2} + \frac{1}{v_3}$

Answer: A

View Text Solution

43. 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. $^{16}O_8^{2-}$

Answer: D

View Text Solution

44. 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. 1215Å

B. 1640Å

C. 2430Å

D. 4687Å

Answer: A

View Text Solution

45. The wavelength of the first line of Lyman series for hyrogen 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

Answer: A

View Text Solution

46. 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 λ_1, λ_2 emitted in the two cases is

A. $7/5$

B. $27/20$

C. $27/5$

D. $20/7$

Answer: D

View Text Solution

47. 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 will be

A. 2

B. 3

C. 5

D. 6

Answer: D

View Text Solution

48. A diatomic molecules is made of two masses m_2 and m_2 which are separated by a distance r. 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. $\frac{(m_1+m_2)n^2 h^2}{2m_1 m_2 r^2}$

Answer: D

View Text Solution

49. Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ. If R is the Rydberg cosntant, 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. $\sqrt{\frac{\lambda R}{\lambda-1}}$

Answer: A

View Text Solution

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

A. $4(x_1 + x_2)$

B. $4(x_2 - x_1)$

C. $2(x_1 + x_2)$

D. $2(x_2 - x_1)$

Answer: B

View Text Solution

51. The transition from the state n =4 to n =3 is a hydrogen like atom results is ultraviolet radiation. Infrared radiations will be obtained in the transition :

A. $2 \rightarrow 1$

B. $3 \rightarrow 2$

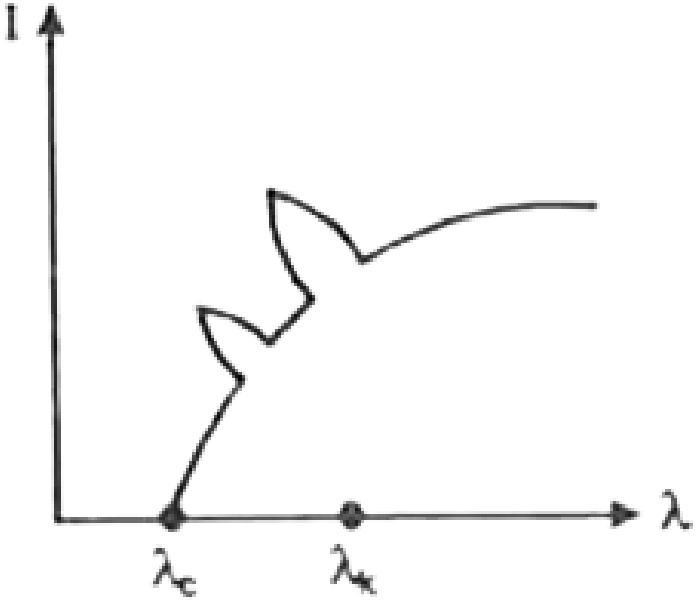
C. $4 \rightarrow 2$

D. $5 \rightarrow 4$

Answer: D

View Text Solution

52. The intensity of X-rays from a coolidge tube is plotted against wavelength λ as shown in the figure. The minimum wavelength found is λ_c and the wavelength of the K_a line is λ_k. As the accelerating voltage is increased.



A. $\lambda_k - \lambda_c$ increases

B. $\lambda_k - \lambda_c$ decreases

C. λ_k increases

D. λ_k decreases

Answer: A

View Text Solution

53. An H_2 atom and Li^{++} ion are both in the second excited state. If l_H and l_{Li} are their respective angular momemtum and E_H and E_{Li} are their energies then :

A. $l_H > l_{Li} \& E_H > E_{Li}$

B. $l_H = l_{Li} \& E_H < E_{Li}$

C. $l_H = l_{Li} \& E_H > E_{Li}$

D. $l_H < l_{Li} \& E_H < E_{Li}$

Answer: B

View Text Solution

54. In the nuclear fusion reaction ${}_1^2H + {}_1^3H \rightarrow {}_2^4He + n$ given that the repulsive potential energy between two nuclei is $-7.7 \times 10^{-14} J$, the temp. at which gases must be heated to initiate the reaction is nearly : $\left(k = 1.38 \times 10^{-23}\right)$

A. $10^7 K$

B. $10^3 K$

C. $10^9 K$

D. $10^7 K$

Answer: C

View Text Solution

55. The binding energy of 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. 13.6eV

B. 3.4eV

C. 122.4eV

D. 30.6ev

Answer: C

View Text Solution

56. When a U^{238} nucleus originally at rest decays by emitting an α - particle having a speed 'u', the recoil speed of the residual nucleus is :

A. $\frac{-4u}{234}$

B. $\frac{4u}{234}$

C. $\frac{-4u}{238}$

D. $\frac{4u}{238}$

Answer: B

View Text Solution

57. A radioactive sample at any instant has its disintegration rate 5000 disintegrations/minute. After 5 minutes, the rate is 1250

disintegrations/min. Then decay constant (per minute) is :

A. 0.2 ln 2

B. 0.1 ln 2

C. 0.8 ln 2

D. 0.2 ln 4

Answer: D

View Text Solution

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

A. $r_n \alpha n$

B. $r_n \alpha \frac{1}{n}$

C. $r_n \alpha n^2$

D. $r_n \alpha \frac{1}{n^2}$

Answer: A

View Text Solution

59. 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. $1 : 3^{1/2}$

B. $3^{1/2} : 1$

C. $1 : 2^{1/3}$

D. $2^{1/3} : 1$

Answer: C

View Text Solution

60. The B.E. per nucleon of $_1H^2$ and $_2He^4$ are 1.1 MeV and 7 MeV respectively. If two deuteron $\left(_1H^2\right)$ nuclei react to form single helium nucleus, the energy released

A. 13.9 MeV

B. 23.6 MeV

C. 26.9 MeV

D. 19.2 MeV.

Answer: B

View Text Solution

61. An α -particle of energy 5 MeV is scattered through 180° by a fixed uranium nucleus. The distance of closest approach is of order:

A. $10^{-15}cm$

B. $10^{-12}cm$

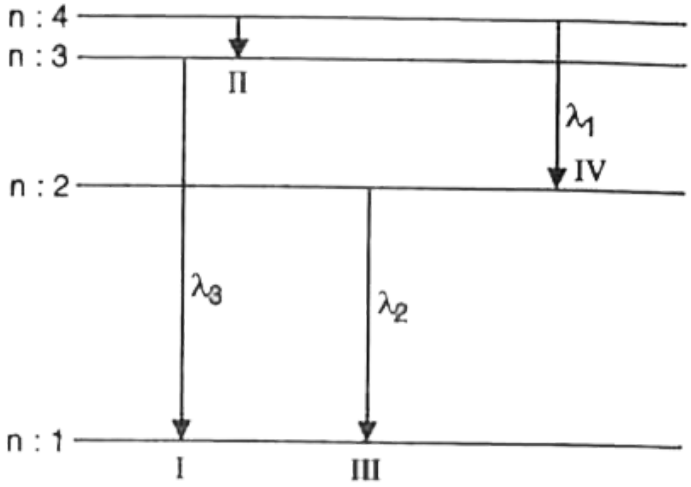
C. $10^{-10} cm$

D. 1Å

Answer: B

View Text Solution

62. The diagram shows the energy level of an electron in a certain atom. Which transition shown represents the emission of a photon with max. energy?



A. I

B. II

C. III

D. IV

Answer: C

View Text Solution

63. The intensity of $\gamma - \text{rays}$ from a given source is I. On passing through 36mm of lead, it is reduced to $\frac{I}{8}$. The thickness that will reduce the intensity to $\frac{I}{2}$, it

A. 18mm

B. 12mm

C. 6mm

D. 9mm

Answer: B

View Text Solution

64. Helium nuclei combine to form an oxygon nucleus. Calculate the binding energy per nucleon of oxygen nucleus, if $m_0 = \quad 15.834\,\text{amu},\ \ m_{He} = 4 - 0026a.\,m.\,u.$:

A. 4MeV

B. 5.24MeV

C. 0

D. 10.26MeV

Answer: D

View Text Solution

65. A p photon having 10.2 eV energy collides with a hydrogen atom in ground state inelastically. After few microseconds, one other photon having 15 eV collides with the same hydrogen atom, then a suitable detector can detect :

A. 1 photon of 3.4 eV and electron of 1.4 eV

B. 1 photon of 3.4 e V

C. 2 photon of energy 10.2 eV

D. 1 photon of 10.2 eV and 1 electron of 1.4 eV

Answer: D

View Text Solution

66. An α-particle of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then distance of closest approach for a nucleus is proportional to :

A. $\frac{1}{Ze}$

B. v^2

C. $\frac{1}{m}$

D. $\frac{1}{v^4}$

Answer: C

View Text Solution

67. $^{221}_{87}Ra$ undergoes radioactive decay with half life 4 days. What is the probablity that a nucleus undergoes decay in two half-lives:

A. 1

B. $1/2$

C. $3/4$

D. $1/4$

Answer: C

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68. If M_O 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. $(M_O - 8M_P - 9M_N)C^2$

B. $M_O C^2$

C. $(M_O - 17M_N)C^2$

D. $(M_O - 8M_P)^2$

Answer: A

View Text Solution

69. 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

Answer: B

View Text Solution

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

A. $E\left({}_{92}^{236}U\right) > E_{{}_{53}^{137}I} + E\left({}_{39}^{97}Y\right) + 2E(n)$

B. $E\left({}_{92}^{236}U\right) < E_{{}_{53}^{137}I} + E\left({}_{39}^{97}Y\right) + 2E(n)$

C. $E\left({}_{92}^{236}U\right) < E_{{}_{56}^{140}Ba} + E\left({}_{36}^{94}Kr\right) + 2E(n)$

D. $E\left({}_{92}^{236}U\right) = E_{{}_{56}^{140}Ba} + E\left({}_{36}^{94}Kr\right) + 2E(n)$

Answer: A

View Text Solution

71. Suppose an electron is attracted toward the origin by a force 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 nth 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. $T_n \alpha \frac{1}{n}, r_n \alpha n^2$

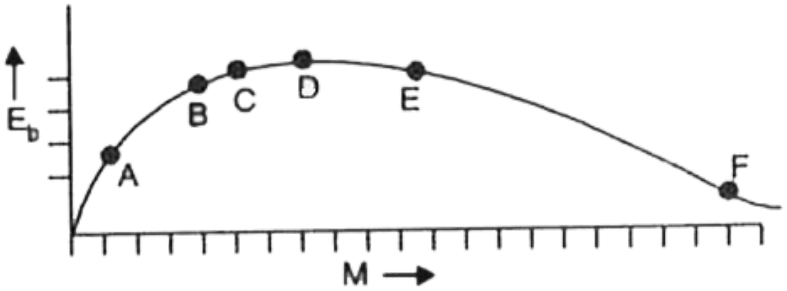
B. $T_n \alpha \frac{1}{n^2}, r_n \alpha n^2$

C. T_n independent of n, $r_n \alpha n$

D. $T_n \alpha \frac{1}{n}, r_n \alpha n$

Answer: C

View Text Solution



72.

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:

(i) $A + B \rightarrow C + e$ (ii) $C \rightarrow A + B + \varepsilon$

(iii) $D + E \rightarrow F + \varepsilon$ and (iv) $F \rightarrow D + E + \varepsilon$

where ε is the energy released? In which reaction is ε positive?

A. (ii) and (iv)

B. (ii) and (iii)

C. (i) and (iv)

D. (i) and (iii)

Answer: C

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73. A radioactive nucleus (initial mass number A and atomic number Z) emits 3 α -particles and 2 positrons. The ratio of number of neutrons to that of protons in the final nucleus will be:

A. $\frac{A-Z-4}{Z-2}$

B. $\frac{A-Z-8}{Z-4}$

C. $\frac{A-Z-4}{Z-8}$

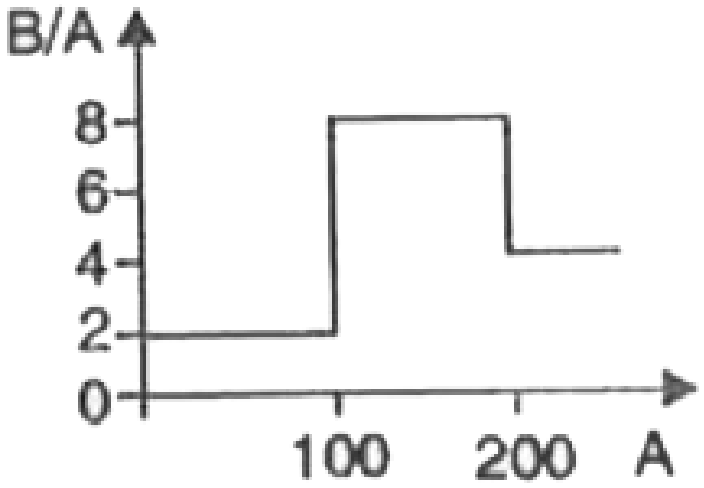
D. $\frac{A-Z-12}{Z-4}$

Answer: B

View Text Solution

74. Assume that the nuclear binding energy per nucleon (BIA) versus mass number (A) is as shown in the figure. Use this plot to choose the

correct choice(s) given below:



A. Fusion of two nuclei with mass mumber lying in the range of $1 < A < 50$ will release energy.

B. Fusion of two nuclei with mass numbers lying in the range of $51 < A < 100$ will release energy.

C. Fission of a nucleus lying in the mass range of $100 < A < 200$ will release energy when broken into two equal fragments.

D. Fission of a nucleus lying in the mass range of $200 < A < 260$ will release energy when broken into two equal fragments.

Answer: B::D

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75. Assume that two deuteron nuclei in the core of fusion reactor at temperature T are moving towards each other, each with kinetic energy 1.5 KT, when the separation between them is large enough to neglect Coulomb potential energy. Also neglect any interaction from other particles in the core. The minimum temperature T required for them to reach a separation of 4×10^{-15} m is in the range.

A. $1.0 \times 10^9 K < T < 2.0 \times 10^9 K$

B. $2.0 \times 10^9 K < T < 3.0 \times 10^9 K$

C. $3.0 \times 10^9 K < T < 4.0 \times 10^9 K$

D. $4.0 \times 10^9 K < T < 5.0 \times 10^9 K$

Answer: A

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76. Results of calculations for four different designs of a fusion reactor using D-D reaction are given below. Which of these is most promising based on Lawson criterion ?

A. Deuteron density $= 2.0 \times 10^{12} cm^{-3}$, confinement time $= 5.0 \times 10^{-3} s$.

B. Deuteron density $= 8.0 \times 10^{14} cm^{-3}$, confinement time $= 9.0 \times 10^{-1} s$.

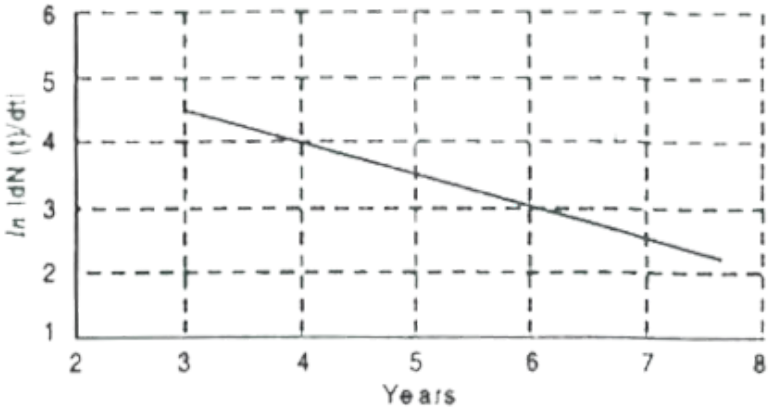
C. Deuteron density $= 4.0 \times 10^{23} cm^{-3}$, confinement time $= 1.0 \times 10^{-11} s$.

D. Deuteron density $= 1.0 \times 10^{24} cm^{-3}$ confinement time $= 4.0 \times 10^{-12} s$.

Answer: B

View Text Solution

77. To determine the half life of a radioactive element, a student plots a graph of In $\left|\frac{dN(t)}{dt}\right|$ 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 years. the value of p is.....

A. 3

B. 5

C. 7

D. 8

Answer: D

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Mcq Level Iii

1. The half life of a radioactive substance is 20 minutes. 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

Answer: B

View Text Solution

2. Statement -1: A nucleus having energy E_1 decays by β^- emission to daughter nucleus having energy E_1 but the β^- rays are emitted with a

continuous energy spectrum having end point energy $E_1 - E_2$.

Statement - 2: To conserve energy and momentum in β -decay at least three particles must take part in the transformation.

A. Statement-1 is correct but Statement-2 is not correct.

B. Statement-1 and Statement-2 both are correct and Statements 2 is correct explanation of Statement 1.

C. Statement-1 is correct, Statement-2 is correct and Statement-2 is not the correct explanation of Statement-1

D. Statement-1 is incorrect, Statement-2 is correct.

Answer: B

View Text Solution

3. 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

Answer: A

View Text Solution

4. The activity of a freshly prepared radioactive sample is 10^{10} disintegrations per second, whose mean life is 10's. The mass of an atom of this radioisotope is 10^{-25} kg. The mass (in mg) of the radioactive sample is

A. 1

B. 2

C. 3

D. 4

Answer: A

View Text Solution

5. Assume that a neutron break in a proton 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. 5.4MeV

B. 0.73MeV

C. 7.10MeV

D. 6.30MeV

Answer: B

View Text Solution

6. Hydrogen atom is excited from ground stats to swather state with principal quantum number equal to 4. Then the number of spectral lines in the emisakon spatra will be:

A. 2

B. 3

C. 5

D. 6

Answer: D

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7. In a hydrogen like atom electron makes transition from an energy level with quantum number n to another with quantum number (n - 1). If $n > > 1,$ the frequency of radiation emitted is proportional to :

A. $\frac{1}{n^2}$

B. $\frac{1}{n^{3/2}}$

C. $\frac{1}{n^3}$

D. $\frac{1}{n}$

Answer: C

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8. Hydrogen $\left({}_1H^1\right)$. Deuterium $\left({}_1H^2\right)$ singly ionised Helium and doubly ionised lithium $\left({}_3Li^6\right)^{++}$ all have one electron around the nucleus. Consider an electron transition from n= 2 to n=1. If the wavelengths of emited radiation are $\lambda_1, \lambda_2, \lambda_3$ and λ_4 respectively then approximately which one of the following is correct?

A. $\lambda_1 = 2\lambda_2 = 3\lambda_3 = 4\lambda_4$

B. $4\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

C. $\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

D. $\lambda_1 = \lambda_2 = 4\lambda_3 = 9\lambda_4$

Answer: D

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9. As an electron makes a transition from an excited State to the ground state of a hydrogen - like atom/ion :

A. Its kinetic energy increases but potential enegy and total energy decrease

B. kinetic energy potential energy and total energy decreases

C. kinetic energy decreases, potential energy increases but total energy remains same

D. kinetic energy and total energy decreases but potential energy increases

Answer: A

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Recent Competitive Questions

1. The spectrum of an oil flame is an example for

A. line emission spectrum

B. continuous emission spectrum

C. line absorption spectrum

D. band emission spectrum.

Answer: B

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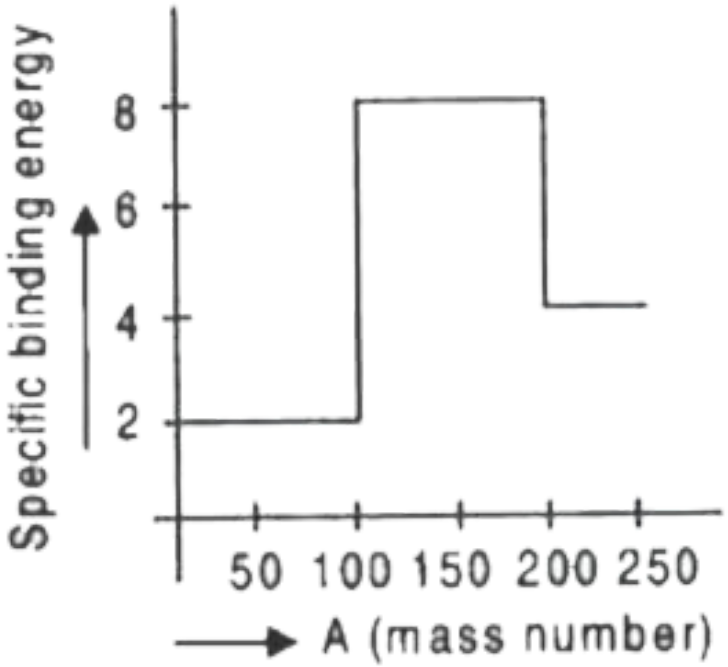
2. Assume the graph of sepecific binding energy versus mass number is as shown in the figure. Using this graph, select the correct choice from the



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. Fission of the nuclous of mass number lying in the - range of $100 < A < 200$ will release energy when broken into two

fragments.

Answer: B

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3. Pick out the correct staternent 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 from a fission reaction

D. For stable nucleus, the specific binding energy is low.

Answer: B

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4. A radioactive sample S_1 having the activity A_1, has twice the number of nuclei as another sample S_2 of activity A_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

Answer: A

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5. When a neutron is disintegrated to give a β-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.

Answer: D

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6. Rutherford's atomic model could account for :

A. stability of atoms

B. origin of spectra

C. the positive charged central core an atom

D. concept of stationary orbits.

Answer: C

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7. When an electron jumps from the orbit n =2 to n= 4, then wavelength of the radiations absorbed will be (R is Rydberg's constant)

A. $\frac{16}{3R}$

B. $\frac{16}{5R}$

C. $\frac{5R}{16}$

D. $\frac{3R}{16}$

Answer: A

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8. The thermonuclear reaction of hydrogen inside the stars is taking place by a cycle of operations. The particular element which acts as a catalyst is :

A. Nitrogen

B. Oxygen

C. Helium

D. Carbon

Answer: D

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9. The ratio of minimum wavelengths of Lyman and Balmer series will be

A. 1.25

B. 0.25

C. 5

D. 10

Answer: B

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10. The fraction of the initial mumber of radioactive nuclei which remain undecayed after half of a half-life of the radioactive sample is :

A. $\frac{1}{4}$

B. $\frac{1}{2\sqrt{2}}$

C. $\frac{1}{2}$

D. $\frac{1}{\sqrt{2}}$

Answer: D

View Text Solution

11. 1 curie represents

A. 3.7×10^7 disintegrations per second

B. 3.7×10^{10} disintegrations per second

C. 10^6 disintegrations per second

D. 1 disintegrations per second.

Answer: B

View Text Solution

12. In the uniform electic field of $E = 1 \times 10^4, NC^{-1}$, an electron is accelerated from rest. The velocity of the electron when it has travelled a distance of $2 \times 10^{-2} m$ is nearly $\left(\frac{e}{m} \text{ of electron } \approx 1.8 \times 10^{-11} Ckg^{-1}\right)$

A. $8.5 \times 10^6 ms^{-1}$

B. $1.6 \times 10^6 ms^{-1}$

C. $0.85 \times 10^6 ms^{-1}$

D. $0.425 \times 10^6 ms^{-1}$

Answer: A

View Text Solution

13. Decay constants of two radio-active samples A and B are 15x and 3x zospectively. They have equal number of initial nuclci. The ratio of the number of nuclei left in A and B after a time $\frac{1}{6x}$ is :

A. e^{-2}

B. e

C. e^{2}

D. e^{-1}

Answer: A

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14. Mass numbr of the elements A, B, C and D are 30, 60, 80 and 120 respectilvely. The specific binding energy of them are 5 MeV, 8.5 MeV, 8 MeV and 7 MeV respectively. Then, in which of the following reaction/s energy released ?

1. $D. \rightarrow 2B$

2. $C \rightarrow B + A$

3. $B \rightarrow 2A$

A. in (1), (2) and (3)

B. only in (1)

C. in (2), (3)

D. in (1), (3)

Answer: B

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15. The ratio of the magnetic dipole moment to the angular momentum of the electron in the hydrogen atom is :

A. $\frac{m}{e}$

B. $\frac{e}{2m}$

C. $\frac{e}{m}$

D. $\frac{2m}{e}$

Answer: B

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16. The radius of $_{29}Cu^{64}$ nucleus in Fermi is : $\left(\text{given } \ R_0 = 1.2 \times 10^{-15} m\right)$

A. 9.6

B. 4.8

C. 1.2

D. 7.7

Answer: B

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17. In a radioactive decay, an element ${}_zX^A$ emits four α- particles, three β -particles and eight gamma photons. The atomic number and mass number of the resulting final nucleus are

A. Z-8, A-13

B. Z-11, A-16

C. Z-5, A-13

D. Z-5, A-16

Answer: D

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18. A radioactive nucleus has specific binding energy E_1. It emits an α -particle. The resulting nucleus has specific binding energy E_2. Then

A. $E_2 = 0$

B. $E_2 = E_1$

C. $E_2 < E_1$

D. $E_2 > E_1$

Answer: D

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19. A proton and helium nucleus are shot into a magnetic field at right angles to the field with same kinetic energy. Then the ratio of their radii is :

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: A

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20. Light emitted during the de excitation of electron from n = 3 to n = 2, when incident on a metal, photoelectrons are just emitted from that metal. In which of the following de excitations photoelectric effect is not possible ?

A. From n=2 to n=1

B. From n=3 to n=1

C. From n=5 to n=2

D. From n=4 to n=3

Answer: D

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21. The additional energy that should be given to an electron to reduce its de-Broglie wavelength from 1 mm to 0.5 mm is:

A. 2 times the initial kinetic energy

B. 3 times the initial kinetic energy

C. 0.5 times the initial kinetic energy

D. 4 times the initial kinetic energy.

Answer: B

View Text Solution

22. The ionisation energy of an electron in the ground state of helium atom is 24.6V. The energy required to remove both the electron is :

A. 51.8eV

B. 79eV

C. 38.2eV

D. 49.2eV

Answer: B

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23. Pick out the correct statements from the following:

I. Electron emission during β -decay is always accompanied by neutrino.

II. Nuclear force is charge independent.

III. Fusion is the chief source of stellar energy.

A. I, II are correct

B. I, III are correct

C. Only I is correct

D. II, III are correct.

Answer: B

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24. A nucleus ${}_zX^4$ emits an α -particle with velocity v. The recoil speed of the daughter nucleus is :

A. $\frac{A-4}{4v}$

B. $\frac{Av}{A-4}$

C. v

D. $\frac{v}{4}$

Answer: B

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25. A radioactive substance emits 100 beta particles in the first 2s and 50 beta particles in the next 2s. The mean life of the samnle ise

A. 4s

B. 2s

C. $\frac{2}{0.693}s$

D. $2 \times 0.693s$

Answer: C

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26. A and B are the two radioactive elements. The mixture of these elements show a total activity of 1200 disintegrations/minute. The half-life of A is 1 day and that of B is 2 days. What will be the total activity after 4 days ? Given, the initial number of atom in A and B are equal :

A. 200 dis/min

B. 250/min

C. 500 dis/min

D. 150 dis/min

Answer: D

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27. The binding energy/nucleon of deuteron $\left({}_2H^4\right)$ and the helium atom (He) are 1.1 MeV and 7 Mev respectively. If the two deuteron atoms fuse to

form a single helium atom, then the energy released is :

A. 26.9 MeV

B. 25.8 MeV

C. 23.6 MeV

D. 12.9 MeV.

Answer: C

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28. Which of the following spectral series of hydrogen atom is lying in visible region of electromagnetic wave ?

A. Paschen series

B. Pfund series

C. Lymen set as

D. Balner series.

Answer: D

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29. What is the energy of the electron revolving in third orbit expressed in eV?

A. 1.51 eV

B. 3.4 eV

C. 4.53 eV

D. 4 eV.

Answer: A

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30. The relation between half-life (T) and decay constant (λ) is:

A. $\lambda T = 1$

B. $\lambda T = \frac{1}{2}$

C. $\lambda T = \log_e, 2T$

D. $\lambda = \log 2T$

Answer: C

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31. A force between two protons is same as the force between proton and neutron. The nature of the force is :

A. weak nuclear force

B. strong nuclear force

C. electrical force

D. gravitational force.

Answer: B

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32. An α -particle of energy 5 MeV is scattered through 180° by gold nucleus. The distance of closest approach is of the order of:

A. $10^{-12}cm$

B. $10^{-16}cm$

C. $10^{-10}cm$

D. $10^{-14}cm$

Answer: A

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33. A radioactive decay can form an isotope of the original nucleus with the emission of particles :

A. one α and two β

B. four α and once β

C. one α and four β

D. one α and one β

Answer: A

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34. The half life of a radioactive substance is 20 minutes, The time taken between 50% decay and 87.5% decay of the substance will be

A. 40 mintues

B. 10 mintues

C. 30 mintues

D. 25 mintues

Answer: A

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35. A nucleus at rest splits into two nuclear parts having radii in the ratio: 1:2. Their velocities are in the ratio:

A. $6:1$

B. $2:!$

C. $8:1$

D. $4:1$

Answer: C

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36. What is the wavelength of light for the least energetic photoa emitted in the Lyman series of the hydrogen spectrum. (take hc = 1240 eV nm):

A. 102nm

B. 150nm

C. 82nm

D. 122nm

Answer: D

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37. If an electron in hydrogen atom jumps from an orbit of level n= 3 to an orbit of level n =2, the emitted radiation has a frequency (R= Rydberg constant, c= velocity of light) :

A. $\frac{Rc}{25}$

B. $\frac{5Rc}{36}$

C. $\frac{3Rc}{27}$

D. $\frac{8Rc}{9}$

Answer: B

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38. A sample of a radioactive element whose half-life is 30s contains a million nuclei at a certain instant of time. How many nuclei will be left after 10 s?

A. 3.33×10^5

B. 3.78×10^5

C. 1.11×10^5

D. 1.26×10^5

Answer:

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39. A radioactive substance decays at 1/32 of its initial activity in 25 days. Its half life is :

A. 4 days

B. 25 days

C. 5 days

D. 20 days

Answer: C

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40. The shortest wave lengths of Paschen, Balmer and Lymann series are in the ratio :

A. $9:1:4$

B. $1:4:9$

C. $9:4:1$

D. $1:9:4$

Answer: C

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